

SCIENCE

FRIDAY, FEBRUARY 15, 1889.

SOME EXAMPLES OF MEXICAN PRE-COLUMBIAN ART.

DURING the winter of 1881 I collected on the site of the ancient city of Teotihuacan ("the place of those who adore the gods"), about forty kilometres north-eastward from the City of Mexico, and within the great valley enclosing the capital, several hundred objects of moulded and modelled terra-cotta. Some of these I gathered from the heaps of *débris* that mark the locality of this "former religious centre of the Nahuatl nations;" but the greater number were secured, generally six or eight in a place, by visits to the houses of the simple agricultural people, who had found them while cultivating the neighboring gardens and fields. The soil in which these objects had reposed for a period of unknown duration, is spread around the two great *teocalli* of earth and broken stone that rise conspicuously above a broad fertile plain. The Pyramid of the Sun, the principal of these prehistoric structures, is prob-

displayed in the great museums in Europe and on this continent to modern apprehension are generally meaningless or grotesque. Often two round cavities stand for eyes; a crooked ridge laboriously furrowed out with stone tools is offered for an arm; or the action of the figure is so violent and crudely expressed, or the surface so overloaded with symbolic designs, that the original thought is lost to the observer of to-day, or seems the work of some unskilled and ignorant devotee. It is, however, not in the hard stone carvings that we can hope to find any adequate evidence of the mental capacity of the aboriginal sculptor. The plastic clay that abounds was all that he could desire for fixing and transmitting his conceptions. Indeed, it seems to me that no form of pristine thought should advance more rapidly and steadily toward excellence than that which may be expressed in clay. The artistic conceptions of the best minds, once formulated in this material, would be transmitted to following generations in the shape most readily comprehended, imitated, and improved, — a model and a stimulus for every succeeding artist.



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ably the highest work of American aboriginal peoples. It overtops the celebrated mound of Cholula nearly fifty feet, and, with a base somewhat larger than that of the chief pyramid of Gizah, it rises 214 feet, nearly half the height of the Egyptian world-wonder.

The rains of many summers have furrowed the sides of this ancient temple into irregular ravines, through the aid of which, and by exercising a little care in selecting a zigzag path, I was able to ride my tough pony to the platform upon the summit.

Among the numerous fragments of terra-cotta obtained as above described, a large proportion are one to two inches in either dimension, and represent the human head or face. Many are reliefs broken, by the action of time or otherwise, from vessels of clay, or from figures more or less complete. These faces or parts of figures are often accompanied by elaborate ornaments, such as necklaces of beads, high head-dresses of feathers, and large ear-rings, all carefully moulded or stamped in the clay. Many pieces consist simply of heads attached to a short neck, without any evidence of having formed part of a more complete figure. From all the evidence in my possession, I conclude these objects belong to a date anterior to the Spanish Conquest. By some students a portion of the types are referred to the Aztec period; another portion, to the Toltec, or even to the pre-Toltec Totonacs; but into this discussion I shall not here enter.¹

The massive Mexican statues of basalt and trachytic lava that are

Out from the dull uniformity of primitive thought from time to time glows the light of a genius whose inventions, transmitted by poetry or tradition or the plastic arts to succeeding enlightened peoples, command from them the warmest sympathy and recognition, — a genius who, like him of "the wooden statue of Sakâra," is hailed as a worthy compeer by cultivated men of the ripest civilization. The student wandering among the conventionalized art-products of the oldest dynasties at Boulaq, stands amazed before this wonderful production of a mind that wrought in the dim twilight of the history of the human race. Thereafter he feels that the possibility always exists of detecting among the works of any unenlightened people isolated examples of a high art insight. The tools of the Sakâra sculptor were of a primitive character, and he sought the soft native wood as a medium for his productions: with still ruder tools at his command, the Mexican artist found the proper medium in the potter's clay that lends itself, with all its perfections, alike to the hand of the mound-builder and to the modelling tools of Canova.

The accompanying engravings represent faces that were selected from those found at Teotihuacan to illustrate the capacity of pre-Columbian Mexican artists. They have been reproduced, without retouching, by the direct process, from my photographs of the originals in the Metropolitan Museum.

No. 1 represents a fragment of terra-cotta engraved about one-third greater than the actual size. It is a portion of a larger clay object, upon which the remarkable face has been impressed by means of a carefully prepared matrix or stamp. This matrix was

¹ For a learned and valuable contribution to our knowledge of the "terra-cotta heads of Teotihuacan," see Mrs. Zelia Nuttall's illustrated essays in the *American Journal of Archaeology*, 1886.

in all likelihood formed of burned clay, like hundreds that have come down from the primeval potters of Europe and America, and was itself made by an impression from an original carving of clay or other substance. The face shows slight evidences of retouching: perhaps the expressive wrinkles over the right eye were added after the figure was impressed by the matrix.

The surface of many ancient Mexican vases is loaded with ornament, such as stamped or modelled faces and heads of men and animals. This fragment may have formed such an ornament; and if the vase was designed to contain the ordinary intoxicating beverage of the Aztec peoples, — the fermented sap of the century-plant (the *Agave Americana*), — the expression of this face would be singularly appropriate, and the association recall the bacchanalian figures moulded by ancient Roman artisans upon their drinking-cups of Samian ware. Enormous quantities of this national drink — the modern pulque, the ancient *octli* — are still consumed, and special trains upon the railway convey it in hogsheads and goat-skins to the capital city from the district where this clay object was discovered.

The story the ancient artist has sought to tell by every lineament of the face is evidently one of habitual and excessive drunkenness. The swollen eyeballs, covered by thick lids; the inane unsymmetric forehead, with a curious forked wrinkle on its weak side; the hanging full and flabby cheeks; the lips, tumid and uncontrolled, enclosing a meaningless mouth, — in all these we have a consistent story of continued vinous excess. This consistency is worthy of especial attention: not a feature or line in all the face fails to give forth the same mute evidence of complete abandonment to the poison. Finally, the artist, with a stroke of genius worthy of Hogarth, has caught the very spirit of besotted helplessness by sinking the entire right side of the face out of symmetry, thus proving, that, while possessing no knowledge of our modern notions of nervous centres and facial paralysis, the pre-Columbian sculptor had developed the capacity to place upon the human face the physiological evidences of a mind and body lost in the last stages of alcoholism.

No. 2 is also a fragment of some larger object, perhaps a vase. It was moulded, as was the case in the former instance, upon a soft prepared surface of clay, by means of a matrix, but it shows no evidence of retouching. It is the face, in relief, of an individual less deeply sunk in bacchanalian indulgence; but the expression is that of a drunkard, and not that of a person in the repose of sleep or nerveless in the relaxation of death. The lips are slightly apart, and there is breath between them. The eyes are closed, but the face is under control, and its texture is firmer than in the preceding figure. It is a work of less merit than No. 1, but the artist has succeeded in delineating drunkenness in every feature, and has maintained throughout the typical stolid expression of the aboriginal American races.

No. 3 represents a face moulded upon the leg of a terra-cotta vase. This portion of the clay vessels of Southern and Central America has often been seized upon by the ancient potter as a basis for elaboration. Sometimes it is wrought to represent the head of an animal, as the crocodile or fish; while among prehistoric pottery from the Chiriqui cemeteries, northward from Panama, nearly every carefully made vase has hollow legs. A ball of clay rattles loosely in this open space, and, through a narrow aperture, may be seen moving when the vessel is shaken. The Mexican vase-legs are in some localities quite abundant, because, like the "crest ears" of the pots of the prehistoric Italian *terramare*, their solidity preserves them where the less firm portions of the vessels have crumbled. The exigencies of the case have confined the artist of this *basso-relievo* to a triangular surface, narrowing downward nearly to a point, and he has admirably adapted his work to the predetermined shape. On the foot of what may have been an ancient pulque jar we see here represented still another and a far more cheerful phase of intoxication. The individual has reached a state of mental excitement where he is "o'er all the ills of life victorious." He "accepts the good the gods provide" with child-like joy and abandon. In the elation of the moment he half closes his eyes, but at the same time, unlike the preceding inebriates, he finds companionship in the outer world by shrewdly keeping it in view. There is no flabbiness in his cheeks and lips: the former are bunched in a jolly grimace; the latter, drawn thinly over

his big teeth, broaden into a grin as successful as the narrowing margin of the vase-leg will permit. In short, we have before us the work of an aboriginal artist, who tells us successfully the story of a jolly reveller, who might be about to sing to his companions the chorus of "Willie brew'd a peck o' maut."

By turning this clay visage at various angles, it is found that the most advantageous view of the features is that from above. A large vase containing a liquid would in simple aboriginal habitations naturally be placed where it would rest below the level of the eye. Can it be possible the ancient artist wrought the model from which this vase-leg was moulded, conscious he was addressing eyes that would look from above upon his completed work?

With evidence before us such as that here detailed of the comparatively advanced culture in one direction of the old Mexican peoples, and of the capacity of some of their artists to deal successfully with complex questions in designing and modelling figures expressing conditions of the human mind, does it not seem probable that upon our southern border a rich field and many surprises await the patient scientific investigator? — a field that is all the more important to the anthropologist, because embedded in it is the history of a culture that may be autochthonous; and that is of all the more moment to us, because this culture grew through many centuries, subject to the developing forces of an environment in some important elements similar to that which is to-day modifying us and converting us into "Americans."

ROBERT H. LAMBORN.

STREET-RAILWAY MEN VISIT AN ELECTRIC RAILWAY.

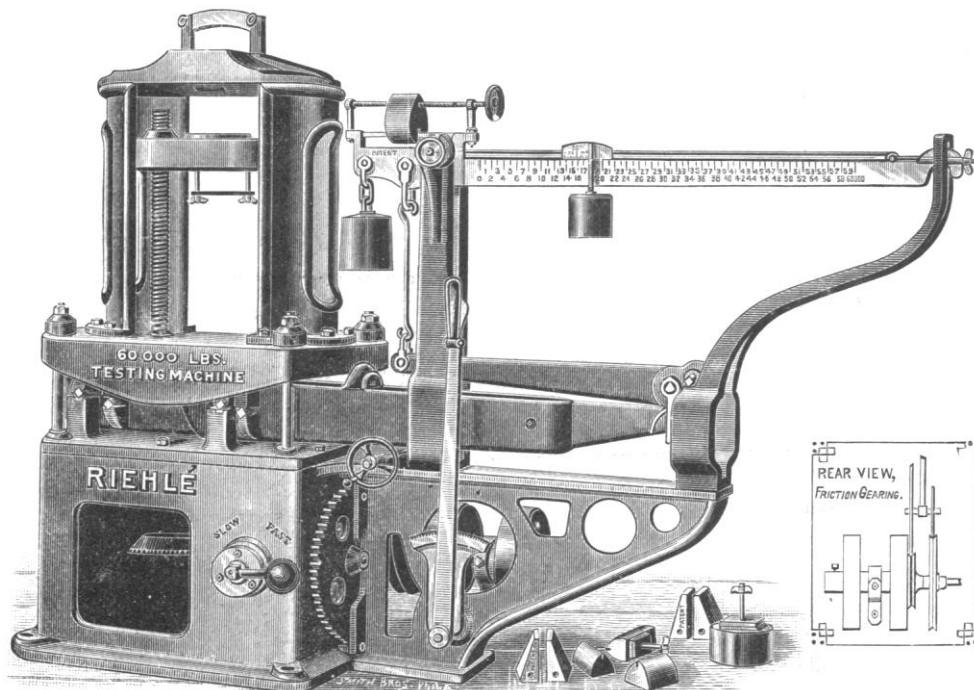
ON Tuesday, Feb. 5, there was a gathering at Boston, Mass., of street-railway men of New England, who had come from all quarters of the six New England States. The object of the gathering was to inspect the electric branch of the West End Road at Boston, installed by the Sprague Electric Railway and Motor Company of New York. The party was met by Messrs. Blake & Sawyer, and the start was soon made from the Park Square end of the line in a number of electric cars which President Whitney of the West End Road had provided for the purpose. The cars were quickly filled by the street-railway men, and the departure made from Park Square in short order out to Boylston Street. The first stop was made at the power-station of the road, situated at Allston, where the visitors disembarked, and were shown the generating-station for the electricity used in operating the cars. On entering the main room, and passing by the two high-speed Arming-ton & Sims engines of 200 horse-power each, — one, though running, being so noiseless in its action that its motion passed almost unnoticed, — the four dynamos, of 80,000 watts capacity each, engaged the attention of the party. From each dynamo there are three leads passing under the floor to the switch-board, where connection is made by separate conductors to the underground conduit and overhead system. This switch-board and each regulator have for their bases an insulating compound to which they are fastened, and each regulator-shaft carries a gear; so that, by means of a rack which meshes into all four gears, the four dynamos may be regulated by one operation. Still higher on the wall are the safety fusible strips mounted on slate. At the top of the switch-board are placed four improved lightning-arresters resting on insulated brackets. These arresters consist of a large electro-magnet, which may be short-circuited in fine weather by a switch. From the terminal connected with the outside line there is a circuit with an alternative path to the ground, with the use of the usual break, an electro-magnet. To a lightning-current passing over the line, the large electro-magnet acts like a choking coil, and offers a large resistance; and the current, taking the alternative path, jumps over the air-space, when the electro-magnet, operating, breaks the circuit, thus extinguishing the arc. The power-station is lighted by a large number of electrolights, under control in groups of five, at a switch-board at one end of the building. The boiler-house has three 150-horse-power steel tubular boilers, with Jarvis setting, feed-water heater, injector, steam-pump, etc. The back wall of the power-house is built with a view to its extension in the rear, so that the capacity at the station can be

doubled, the position of the chimney being in the centre of the future station. Adjoining the power-station a new car-house has been erected, with capacity for twenty-six cars. The cars, when in this house, rest on skeleton tracks, under which the inspectors can walk, and, by aid of incandescent lamps with flexible connections, can examine and inspect the machinery of each car. After the party had fully examined the workings of the power-station, and listened to the explanations of its operation from the engineer in charge, they reboarded the electric cars, and were carried quickly out Beacon Street and Harvard Avenue to the terminus of the road at Oak Square, Brighton. To a great many in the party this trip was the first ever made on an electric railway, and the exclamations of surprise and delight were universal. On the return trip the cars were speeded to ten or twelve miles an hour in places, and much praise was bestowed upon the easy starting, which was prompt though without jar, the complete control over the car, and the ease of the car in rounding curves and in speeding. Each of the cars was brilliantly lighted by five incandescent lights of 16 candle-power each, — three inside the car, and one on each platform. These lamps had the municipal cut-out; and, when one

about 3,500 pounds, is 6 feet in height, and occupies a space 8 feet long by 2½ feet wide.

For tensile strength, the machine will test specimens up to 18 inches in length, 1¼ inches square, 1⅝ inches in diameter if round, and 2⅝ by 1 inch if flat, allowing for a 25-per-cent elongation in the longest specimens, and more for those of shorter length. For transverse strains, it will test specimens from 6 to 20 inches in length; and for compression, specimens up to 8 inches long and surfaces up to 6 inches in diameter. The pulling head has a movement of 23 inches. The machine has four different speeds for tensile and transverse tests, and two for compression, as follows: transverse and tensile, 4 inches per minute, 1 inch per minute, 1 inch in 3½ minutes, and 1 inch in 10 minutes; compression or reversing, 4 inches per minute, and 1 inch in 3½ minutes.

Power is applied by levers and friction-pulleys for starting, stopping, and reversing; and for changing the speeds, a hand-wheel and tumbling ball are used. In compression tests, and in tests of material not ductile, when the pressure is run up rapidly, there is an arrangement of friction-gears, similar to those of a hoisting-engine, which gives an extremely slow and steady motion to the



RIEHLÉ SCREW-POWER TESTING-MACHINE.

breaks, the increase of candle-power in the remainder calls the attention of the conductor, who inserts a new lamp. The visitors left Boston for their respective homes full of enthusiasm over the application of electricity to street-railways, and with a better knowledge of the advantages which electric power has for this purpose over any other power.

THE RIEHLÉ TESTING-MACHINE.

TESTING-MACHINES have become a necessary part of the equipment of all manufacturing establishments and constructive works, government and private, where the strength of materials must be accurately determined. Among the testing-machines now in use, those made by the firm of Riehlé Brothers of Philadelphia stand prominent as examples of good workmanship, strength, accuracy, and convenience in use. The accompanying illustration shows one of these machines. It is a vertical screw-power machine for testing materials by tensile, transverse, and compression strains, and has a capacity of 60,000 pounds. Other machines made by the same firm range in capacity from 10,000 to 200,000 pounds. The levers on the machines of all capacities are adjusted to the United States Government standard.

The machine shown in the engraving is adapted for those whose requirements do not call for one of greater capacity. It weighs

screw, thus enabling the operator to make the test with ease and accuracy. The bearings are of hardened steel balls, which do away with much of the friction incident to this class of testing-machines.

THE FLEISCHMANN SYSTEM OF GARBAGE-DISPOSAL.

ONE of the systems of garbage-disposal which seems to be one of the best is that known as the Fleischmann, and is now in practical operation in Buffalo. In speaking of this system, the *Sanitary Inspector* says:—

"The Fleischmann system of garbage-extraction consists principally of two processes. The garbage, as it is hauled in, is shovelled through man-holes into driers below. There are two of these driers, each receiving at one charge 5,000 pounds of garbage. Each drier consists of a double-walled metallic cylinder, between the walls of which steam at a pressure of about eighty pounds is admitted. In the interior of each drier, a rake revolves, constantly stirring up the garbage. These rakes are composed of steam-pipes into which steam of the same pressure is admitted, but the steam is not admitted into the chamber which contains the garbage. The steam which arises by the drying of the garbage is drawn out of

the drier by means of a fan, so that a partial vacuum is constantly maintained in the drier; and this steam is carried into the lower part of a chamber, where, as it rises, it meets with a series of sprays or sheets of water which fall from overlapping shelves. In this way the steam which comes from the drier is condensed, and flows away as an inoffensive rill, having no more odor than the condensed water of an ordinary steam-radiator. In this process of drying, sixty per cent of the weight of the garbage is removed.

"The second stage of the operation consists in putting the dried garbage into an apparatus called an extractor, where the grease and oil which it contains is thoroughly removed by benzine used in an automatic way, so that it is used over and over again without loss. The present plant in Buffalo disposes of about 30,000 pounds of garbage daily. From this, about 1,800 pounds of grease is recovered; and the remainder of the dried and pulverized garbage, amounting to a daily average of about 12,000 pounds, is quite rich

SPRAGUE ELECTRIC ROADS AT READING AND WILMINGTON.

IN this issue of our paper we present views of two recent electric roads, taken from photographs, — one in Pennsylvania, and the other in Delaware.

One of these represents one of the cars upon the Wilmington, Del., City Railway. This railway, which was installed by the Sprague Electric Railway and Motor Company of New York, has been in operation for about eight or nine months; and the president and the directors of this road have felt so very well pleased with its operation, that they have ordered an additional number of cars. The railroad is two miles long, using the regular Sprague overhead system of wiring, with small working conductor three-sixteenths of an inch in diameter, which, according to the Sprague system of electric railways, is the only wire suspended over the street.



SPRAGUE ELECTRIC ROAD AT WILMINGTON, DEL.

in ammonia, phosphates, and the other constituents which are valuable in fertilizers, and it is readily sold to the manufacturers of fertilizers. This dried product is screened, and what is removed is sorted out, and nearly all of it finds a market. The old rubber brings a good price; the rags are sold; the bones are valuable as a source of bone-meal; the waste tin, brass, and other fragments of metal, all readily sell; and only a small residuum, such as corn-cobs, pieces of crockery ware, etc., are used as filling. According to the showing of those who are pecuniarily interested, and of the health authorities at Buffalo, a business of this kind pays a good percentage on investment, and an examination of the works must convince any person that a sanitary triumph has been achieved. Upon the first introduction of the garbage to this treatment, it is subjected to a temperature which of course immediately disinfects it, if any of it should be infectious; and from none of the processes through which the garbage is put is there the least odor which is suggestive of danger; and, though much benzine is used in the second stage of the treatment, no smell of it whatever is detected anywhere in the establishment during its use."

Our other view gives a representation of two electric cars on the East Reading and Black Bear Railway, passing each other upon a turnout. This road has recently been installed by the Sprague Electric Railway and Motor Company, and has been in operation only about two months. The road has been operating very successfully ever since its installation, and has been carrying a large number of passengers.

FOGS.

AT the anniversary meeting of the Royal Meteorological Society, held on the 16th of January, Dr. W. Marcet, president of the society, delivered an address on "Fogs," which he illustrated by a number of interesting lantern-slides. Fogs and clouds are one and the same thing. A cloud is a fog when entered into; and a fog seen from a distance, suspended in the air, becomes a cloud. After describing the various kinds of fog, — e.g., river, sea, Newfoundland, radiation, town, etc., fogs, — Dr. Marcet referred to London fogs. Dr. Tyndall has accounted for them by assuming each particle of

condensed vapor to be covered by coal-smoke. These fogs usually accompany a high barometer, and are frequently dry in their character.

It is a well-known fact that cold air on the tops of hills, being heavier than the air below, slides down the slopes; so that the lower parts of hillsides are actually colder than the plains at some distance from the hills. Now, London, in the Thames valley, is surrounded by hills, — to the north, Highgate, Hampstead, and Harrow; in a westerly direction, Putney and Wimbledon; and in a more southerly direction, Clapham and Sydenham. The air is colder on these hills than in London, with its millions of inhabitants, its coal-fires and factories: hence it is heavier, and will have a great tendency to slide down the hills towards the town and the river. Should the air in town be on the point of saturation, and the cold air from above saturated with vapor, it is obvious that the increased cold from above will produce a precipitation of moist-

working drawings made, but actual construction is required, and is made possible in extensive workshops, the equipment of which has cost over forty thousand dollars. In electricity, in addition to the instruments and appliances usually found in electrical laboratories, it possesses the most complete and accurately adjusted series of Sir William Thomson's electrical balances in this country; and there is a completely equipped testing-room for the purpose of calibrating and standardizing commercial instruments. Another important feature is the restriction placed upon the number of students admitted. The plan of the institute is to limit the attendance to such an extent as to realize the great benefits arising from small classes. Ample facilities will therefore be afforded to all who undertake its courses of study. Those who are contemplating preparation for either mechanical, civil, or electrical engineering, will do well to consult the catalogue of the Rose Polytechnic Institute.



TURNOUT ON THE SPRAGUE ELECTRIC ROAD AT READING, PENN.

ure, and it will come to pass that a fog is produced. If the hill-tops be not only colder than the air below, but enveloped in a fog, it stands to reason that the fog below will be all the denser, and especially in the neighborhood of water, such as the river Thames, and the ornamental waters in the parks.

THE ROSE POLYTECHNIC INSTITUTE.

THE Rose Polytechnic Institute is one of three or four schools in the United States which are especially devoted to the education of civil, mechanical, and electrical engineers. It owes its existence to the generosity of the late Chauncey Rose of Terre Haute, Ind., who bequeathed something more than half a million of dollars for its establishment and support. It is one of the youngest of the technological schools of the country, having been opened in the year 1883. One of the peculiar features of the institute is the thorough and extensive "shop-practice" of the students in mechanical engineering. Not only are machines designed, and

THE DERELICT AMERICAN SCHOONER "W. L. WHITE."

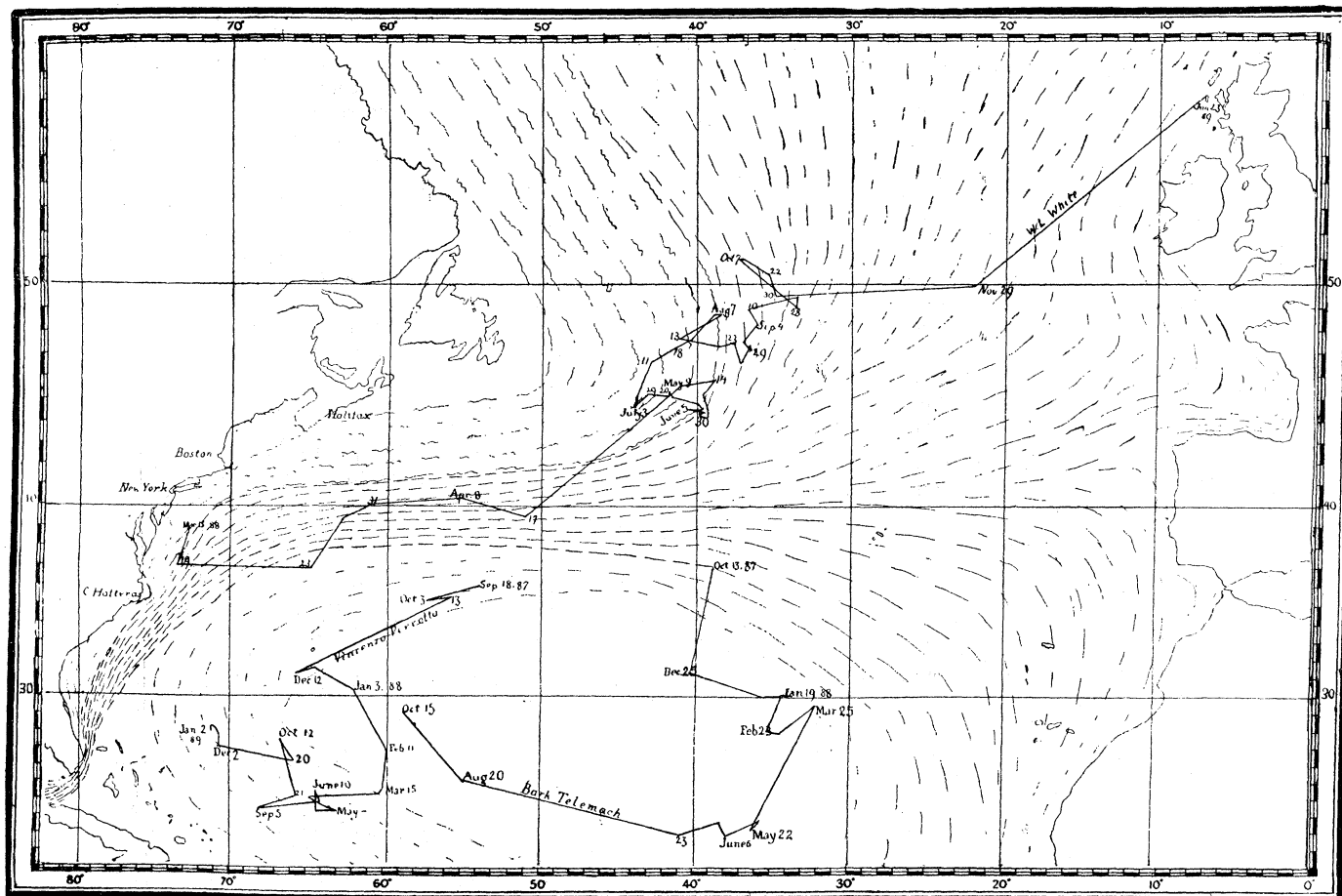
MR. EVERETT HAYDEN, meteorologist to the Hydrographic Office, has compiled the reports on the history of the derelict schooner "W. L. White," and the results of his investigation have been published on a supplement to the monthly "Pilot Chart," a portion of which is reproduced here. Besides showing the track of the "W. L. White," those of the derelict barks "Telemach" and "Vinocuzo Perrotta" have been plotted on the map.

Mr. Hayden reports that a telegram dated Stornoway, Hebrides Islands, Scotland, Jan. 23, 1889, marks the termination of the remarkable cruise of this derelict vessel. Abandoned off Delaware Bay during the great blizzard, March 13, 1888, she has now completed her long and erratic transatlantic voyage, and lies stranded upon Haskeir Island, one of the many little rocky islands of the Hebrides, in latitude $57^{\circ} 42'$ north, longitude $7^{\circ} 42'$ west. The track of this vessel, as plotted on the "Pilot Chart" from month to month during this long interval, has been of constantly increasing

interest, and a study of her track and the tracks of other derelicts plotted on the accompanying chart cannot fail to be valuable to every navigator of the North Atlantic, as illustrating the general course followed by these dangerous obstructions to navigation, and the irregularities to which this general course is subject. The fact may well be noted here that the tracks and latest reported positions of derelicts and wreckage on the high seas are shown on no other chart but the "Pilot Chart," and the danger to navigation caused by them is sufficiently indicated by the mere statement that the number recorded each month in the North Atlantic alone varies from twenty-five to as many as forty-five, every great ocean storm largely increasing the number. Therefore it is very desirable that masters of vessels should supply the Hydrographic Office with ex-

about by the varying winds, a constant menace to navigation along the greatest highway of ocean commerce in the world. During these six months alone she was reported by 36 vessels, three of which sighted her in a single day. In her cruise of ten months and ten days she traversed a distance of more than 5,000 miles, was reported 45 times, and how many more vessels passed dangerously near her at night and in thick weather it is impossible to even estimate.

The direction and force of the winds that helped to determine her track during this long voyage, as indicated by reports from hundreds of vessels in her vicinity at various times, were as follows. For a week after being abandoned, and in fact throughout March, with the exception of four days, she experienced north-westerly



The history of this derelict furnishes the strongest possible proof of the importance of this subject to masters of vessels, as well as of the cordial support which they have given to the Hydrographic Office in its efforts to collect and publish early and accurate information by means of which this danger to navigation may be diminished. The various commercial nations should unite in the effort to keep the seas clear of such obstructions, and it is a subject that may well be discussed by the forthcoming International Maritime Conference.

HEALTH MATTERS.

TYPHOID STATISTICS.—Professor Ruata of Perugia is authority for the statement that there are annually in Italy nearly 300,000 cases of typhoid-fever, of which number 27,000 prove fatal. One-third of the persons in Italy who reach the age of forty-five have the fever, and in some districts more than three per cent of the population die from this one cause.

ARSENIC IN FABRICS.—The *London Chemical News* states that Mr. A. W. Stokes has examined a hundred samples of imitation Indian muslins and cretonnes, and found that twenty-three per cent contained arsenic in appreciable quantities, the highest proportion 2.1 grains of white arsenic per square yard. The colors in which arsenic was principally present were the terra-cotta reds and the greenish-browns. Of the wall-papers submitted to Mr. Stokes by various manufacturers, ten per cent were found to contain arsenic. Thirty other articles of household use, such as plushes, velvets, carpets, mats, silks, etc., were examined, and in only one sample—a little flax mat of green color—was arsenic found.

BACTERIA IN THE GLACIERS.—Dr. Schmelt of Christiania (*Centralblatt für Bacteriologie*) has found vast colonies of bacteria in the ice of the Jerstedalsbræ glacier and in the streams fed by it. They appear under the form of rods, and resemble the *Bacillus fluorescens liquefaciens*. During their period of growth these bacteria emit a fluorescent material. They multiply with great rapidity during periods of thaw.

A NEW DEODORANT.—Bromine has for a long time been recognized as being valuable in the treatment of gangrene and foul-smelling ulcers; but until recently its merits as an effectual and cheap deodorant have not been appreciated, according to the *New York Medical Journal*. It was brought into prominence a few months ago by Mr. Martin, the chemist of the health department of this city, who suggested its use upon the earth thrown up in laying the electric subways. As it is a by-product obtained in the manufacture of salt, and is not used extensively in the arts, it is sold at a very reasonable price,—about seventy cents per pound. It has the property of precipitating the hydrocarbons of illuminating-gas, and thus can be used to deodorize the earth exposed in excavations in the vicinity of gas-mains. More valuable than this is its effect upon decomposing organic bodies, which it renders completely inoffensive. This property renders it particularly valuable for use in stables, privy-vaults, urinals, cesspools, or in any place which may contain foul-smelling organic matters. It is soluble in about thirty-three parts of water; but a solution of this strength is not advisable, as there is a constant escape from it of the vapor of bromine, which is very irritating to the eyes and air-passages, and which may even attack wood and metals. For ordinary purposes it is used in solutions containing one part by weight to about eight hundred of water. In this strength it may be used freely without its affecting anything which it may touch. A few gallons used daily will remove all ammoniacal odors from stables, or a few quarts will thoroughly deodorize the entire plumbing system of an ordinary house. It also might be used with advantage upon ordinary house-garbage, which usually becomes offensive so speedily in warm weather. There would appear to be scarcely any limit to its usefulness in this branch of sanitary science; and it will, as soon as its merits are better known, undoubtedly be adopted universally as a substitute for the deodorants now in use, which usually act by substituting one unpleasant odor for another. The only drawback in its use lies in the fact that the undiluted bromine is strongly corrosive, and, if it touches the skin, causes a painful

burn. Where it is used in large quantities, this can be obviated by opening the bottle, or, what is simpler, breaking it, under water. As its use becomes more extended, it will undoubtedly be put up in pearls or tubes containing only as much as would be needed at one time in the average household.

TRANSMISSION OF DIPHTHERIA.—Dr. De la Roche believes that diphtheria can be transmitted from animals to man. He has had under his care two women suffering from diphtheria, which he thinks he has traced to the contamination of drinking-water from a cistern by the excrement of pigeons, which had been washed down by the rain from the roof on which these birds had perched. Admitting the possibility of the transmission of diphtheria in this manner, the means of combating it are simple. In places where spring-water and well-water are not available, or where the supply consists of rain-water collected in cisterns, it is well to limit pigeon-breeding, and to construct dove-cotes as far away as possible from dwelling-houses. As to the construction of cisterns, they should be built according to the rules of public hygiene laid down by Gania in his work entitled “*Utilité des Citermes*.”

MALARIA.—Dr. Henry B. Baker, the well-known sanitarian, contributed a paper, at the last meeting of the American Medical Association, on “Malaria, and the Causation of Periodic Fever.” After an able discussion of the subject, he sums up as follows: “So far as evidence is yet presented, it seems to be proved, then, that (1) intermittent fever is proportional, directly or inversely, to the average daily range of atmospheric temperature; (2) the controlling cause of intermittent fever is exposure to insidious changes, or changes to which one is unaccustomed, in the atmospheric temperature; (3) in the mechanism of the causation of intermittent fever, the chief factor is the delay in the re-action from exposure to cool air (this delay, extending to a time when greater heat-loss should occur, results in the abnormal accumulation of heat in the interior of the body, and in disturbed nervous action,—the chill), and the final re-action is excessive because of the accumulation of heat, and sometimes because it occurs at the warmest part of the day; (4) the fever is the excessive re-action from the insidious influence of the exposure to cool air, and it is periodical because of the periodicity of nervous action, and because the exposure and the consequent chill are periodical, owing to the nightly absence of the warmth from the sun; (5) residence in valleys, or on low lands through which or upon which cold air flows at night, and thus causes insidious changes in the atmospheric temperature, favors intermittent fever; (6) in our climate, those measures, such as drainage, which enable the soil to retain warmth during the night, and thus reduce the daily range of temperature immediately over such soil, tend to decrease intermittent fever among residents thereon; (7) in the cure and prophylaxis of intermittent fever, those remedies are useful which lessen torpidity, and tend to increase the power of the body to re-act promptly to insidious changes in atmospheric temperature; (8) the slowness of the pulse, and other indications of torpidity, associated with retention of bile or with certain disturbances of the functions of the liver, are well known; but, so far as known to the writer, these conditions have not heretofore been considered as causative of the fever in the manner herein suggested.

SCIENTIFIC NEWS IN WASHINGTON.

Rock-Gas and Related Bitumens.—A Diagram of the World's War-Vessels.—The Eastern Cherokees.—Some Habits of Koreans.

Rock-Gas and Related Bitumens.

IN a communication (the second on the list) presented before the Philosophical Society on Feb. 2, Mr. W. J. McGee pointed out, that, *pari passu* with the industrial development accompanying the utilization of rock-gas, geologic science has made an unparalleled stride within a few months. When exploitation for gas began in Ohio in 1886, the geologist found himself utterly unable either to guide the efforts of the prospector or to predict the results of his work; yet within the ensuing two years the laws governing the accumulation and distribution of gas and oil have been so fully developed that the rock-gas problem to day claims a solution as satisfactory as

that of the well-known artesian-water problem, and the geologist predicts the success or failure of a prospect bore for gas or oil about as readily and reliably as he predicts artesian water or coal. The solution of the problem of rock-gas and petroleum marks an era in science no less than in industry. Mr. McGee discussed also the origin and distribution of gas, petroleum, and allied bitumens, showing that they are distributed throughout the various countries and geologic formations of the globe; that, other things equal, they are most abundant in the newer formations; that, other things equal, they are lighter in newer than in older formations; that the commercially available supplies of oil and gas are accumulated in natural reservoirs formed by flexures of the rocky strata into domes and anticlinals; and that in the American fields, at least, rock-gas, petroleum, and the heavier bitumens are simple products of natural processes of decomposition of the organic matter contained in sediments, their weight and other attributes depending upon the conditions under which decomposition took place. In conclusion, he pointed out that at the present rate of consumption the coal-fields of the earth will be exhausted within a few centuries, when it will become necessary to utilize, more completely than has yet been done, the much more abundant supplies of carbon compounds disseminated throughout the rocks of the earth in the form of bitumen. Rock-gas and related bitumens are indeed destined to form the fuels and illuminants of the future.

A Diagram of the World's War-Vessels.

Lieut. R. P. Rodgers, chief of the intelligence bureau of the Navy Department, has arranged in his room a curious and important map. It is a large map of the world on Mercator's projection, and on its surface are pinned colored tags showing the present position of all the war-vessels of the world. British vessels are represented by red tags, French by light blue, German by purple, American by dark blue, etc., and the positions of them are daily re-adjusted so as to conform to the latest advices. By this pictorial arrangement the secretary can in a moment sweep the seas, and ascertain exactly the whereabouts and strength of the naval power of the world.

Of the ships indicated in commission on the map, about one hundred and fifty belong to Great Britain and one hundred to France, while Germany and the United States have not more than forty each. Italian ships are mostly in the Mediterranean; Spanish ships, chiefly in the West Indies and at home. Germany has three war-ships at Samoa; the United States has one, and two more on the way, in the aggregate superior to the German contingent. China has a dozen or twenty ships, all on her own coast. She is not aggressive. In Central America we are outnumbered in a way to suggest that the Monroe doctrine is not to be enforced at once. We have at the Isthmus of Darien one pretty poor ship on the east side, none on the west side. France has one on each side, and Great Britain has three on each side. We have four vessels on the West African coast, and half a dozen in the seas of the Orient.

The Eastern Cherokees.

Mr. James Mooney of the Bureau of Ethnology, who has been for several years studying the Cherokees, is making some interesting reports of their condition and customs. It may not be generally known, he says, that the Cherokees, whose expulsion from Georgia and the contiguous States in 1838 was one of the most flagrant violations of treaty rights ever perpetrated by the United States Government, have not entirely abandoned their ancient country. On the contrary, a portion of the tribe, officially known as the "Eastern Band of Cherokees," still keeps up an organization in North Carolina, with its council, chiefs, and medicine-men, and numbers in all about two thousand souls, of whom about fifteen hundred are mainly full-bloods, speaking only their native language, while the remainder are more white than Indian. In addition to these, the official roster includes several hundred others who claim Cherokee rights, — to wit, a share in the tribal lands and educational privileges, — but the keenest observer could not distinguish them from any other white men; and their Indian blood, which in many cases is an extremely doubtful quantity, and denied by the Cherokees themselves, is about as dilute as that of the modern descendants of Pocahontas. Excluding these pseudo claimants, it will thus be seen, by reference to the report of the Indian commissioner, that

we still have in North Carolina a body of Indians about as numerous as the Arapahoes or Winnebagoes in the West, and far outnumbering such noted tribes as the Pawnees, Omahas, Osages, Comanches, and Nez Percés.

These Cherokees are chiefly in Swain, Jackson, and Graham Counties, and own altogether eighty-eight thousand acres. The reservation proper lies principally in Swain County, and contains one hundred and fourteen square miles, occupied by about twelve hundred souls, very few of whom can speak English. Their principal settlement is Elawāti ("paint clay"), known to the whites as Yellow Hill or Cherokee. Here are the council-house, the chief's residence, and the government training-school, containing nearly a hundred children under the efficient instruction of teachers appointed by the Quakers, under a contract with the government. There are five other day-schools supported by the interest on their *pro rata* share of the fund appropriated for the removal of the Cherokees in 1836. Aside from this, the band receives no aid from the government, the Supreme Court having decided that they are not entitled to participate in the benefits arising from any former treaties with the Cherokees, so long as they refuse to join the body of the tribe in the Indian Territory, — a proposition to which they are bitterly opposed. Their legal status is a peculiar one. Although living on a reservation, under care of an agent, and holding their lands in common, they are treated rather as intractable children, and deprived of the privileges accorded the rest of the tribe; while, on the other hand, they have the rights of citizenship, and vote at all local and general elections. In politics they are Republicans almost to a man, as they consider the success of their schools due to that party.

These Cherokees are the descendants of the few individuals who were allowed to remain under the treaty of removal in 1835, and of the larger number who fled to the mountains, and thus eluded the soldiers who were sent out under Gen. Scott to collect the Indians for removal to the West. Many of the older ones still remember with bitterness the events of this period. These Indians may fairly be called warriors, as three hundred of them served in the Confederate army during the late war, while quite a number also fought on the Union side. The former were a part of the Thomas Legion, occupied chiefly in East Tennessee. They are now quiet, law-abiding citizens, cultivating their small farms, and gathering chestnuts and ginseng in the mountains, to trade for cloth and coffee at the neighboring villages. A few are fairly prosperous, but the majority are in a condition of abject poverty. Isolated in the heart of the mountains, neglected by the general government, and deprived even of schools until within a few years ago, they are fully two-generations behind their more fortunate brethren in the West, and still keep up their old dances, ball plays, and conjuring practices, although many of them are professing Christians. Their present chief, N. J. Smith, known to his tribe as Tsalatihi, is an honorable and intelligent gentleman, of three-fourths Cherokee blood, speaking both languages fluently, and thoroughly devoted to the interests of his people. Through his efforts and the influence of the schools, the old Indian life is gradually giving place to the newer civilization.

Some Habits of Koreans.

On Saturday afternoon, Feb. 2, Mrs. E. R. Scidmore read a paper on the home-life of the Koreans, among whom she visited in 1887 as a guest of Judge Denny, the foreign adviser to the king. She said the Koreans are in most things poor copies of the Chinese. Their dress is the same as that worn by the Chinese before the Manchu conquest, which made the pigtail obligatory as a sign of submission. Wispis of straw and bits of cloth, says Mrs. Scidmore, hang at the doorways to delude the Devil and keep off evil spirits; and these are the only signs of worship seen about Seoul. They have the worship of ancestors, as the Chinese; and a trace of the old dragon-worship must order their toleration of snakes, as it is impossible to get a Korean servant to kill the snakes that drop from the mud roof and slip out of the flues of the kaugs that warm the floors of the houses.

Until the arrival of the American physicians, the king and queen had an army of necromancers and wizards in attendance upon them, and a form of shamanism was practised upon the sick. They were consulted as well in matters of state policy.

The strict seclusion of the women is relaxed on one day in June, when women may go anywhere with uncovered faces. The homes of the foreign residents in Seoul are visited then by thousands of curious women.

If a man walks over all the foot-bridges of the city on the middle day of January, he is supposed to secure good health for the year.

The city gates are closed and locked from dark until dawn, and it is death to the guardsman who opens them to admit any one. Generations of belated and wall-scaling Koreans have worn a staircase of crevices in the wall by which they mount to the gate tower; or the guardsmen will haul them up by a rope, there being a regular tariff of charges for the use of ropes, and the mandarins getting their regular percentage of the fees.

The manufactures of to-day are very crude and wholly inartistic. Peddlers of tin bring pieces of iron damascened with silver, that at once prove the Persian influence of the old arts by the decorative forms. Korean ambassadors are supposed to have met the Persians at the Peking Court in the time of Genghis and Khublai Khan.

ETHNOLOGY.

Mound-Builders and Indians.

IN a recent number of the *Ohio Archaeological and Historical Quarterly*, Mr. Gerard Fowke attempts to disprove "popular errors in regard to mound-builders." The author shares the view of Professor Cyrus Thomas, that the mound-builders were Indians, and that no great antiquity must be claimed for their works. The principal points adduced by the supporters of the theory of the existence of an ancient high state of culture and of a dense population are taken up one by one and discussed. Thus he reduces the opinion regarding the high character of the works of the mound-builders to its proper level. One of the important points to be decided, in an estimate of this ancient race, is the question regarding the density of population. The same reasons which were claimed for an ancient dense habitation of Arctic America have been considered as proof in the case of the mound-builders. It is said that numerous ruins on a limited area indicate a great number of inhabitants; but, as no proof can be given that they have been inhabited simultaneously, it is quite possible, that, notwithstanding their great number, the population was very sparse. It seems to us that the author's doubts as to a considerable antiquity of some of these ancient monuments are not well founded; but his criticism of the exaggerated views regarding the works and civilization of this ancient race is timely, and will help to the formation of a juster appreciation of the real significance of these works.

THE JADE QUESTION. — F. W. Clarke and G. P. Merrill have made an examination of a series of jade implements from the collections of the United States National Museum. The results of this investigation, which were published in the "Proceedings of the United States National Museum," are in favor of the theory that the occurrence of implements made of similar varieties of jadeites and nephrites in widely separated countries must not be considered proof of a common source of the material. The authors, whose arguments are based on very exhaustive microscopical and chemical investigations, believe that it is hardly practicable to distinguish, by means of thin sections and the microscope, between nephrites from various sources. "The presence or absence of enclosures of diopside, magnetite, or ferruginous oxides; the condition of these oxides, whether as ferric or ferrous; the varying tufted, bent, confused fibrous and even granular condition of the constituent parts, — are all, together with the color-variations and other structural peculiarities, matters of too slight import to be of weight from a petrographic standpoint. If, as seems possible, the majority of the nephrites are of secondary origin, why may we not expect to find all, or at least a great variety, of the structures described in the same or closely adjacent rock-masses? Chemical analyses on samples from near-lying, or even the same, localities are found often to vary as greatly as those from localities widely separated. Why may we not expect the same structural variations, when once they are carefully looked for? To our own minds, sufficient assurances that the widely scattered jadeite and nephrite objects were derived from many independent sources, and possess no value whatever in the work of tracing the migration and inter-communi-

cation of races, lie in the fact that these substances are comparatively common constituents of metamorphic rocks, and hence liable to be found anywhere where these rocks occur. Their presence is as meaningless as would be the finding of a piece of graphite. The natives required a hard, tough substance capable of receiving and retaining a sharp edge and polish, and took it wherever it was to be found."

SIGNALLING AMONG PRIMITIVE PEOPLES. — As is well known, the Indians of our continent use rising smoke to give signals to distant friends. A small fire is started, and, as soon as it burns fairly well, grass and leaves are heaped on top of it. Thus a large column of steam and smoke rises. By covering the fire with a blanket, the rising of the smoke is interrupted at regular intervals, and the successive clouds are used for conveying messages. Recently R. Andree has compiled notes on the use of signals by primitive people, and finds that they are well-nigh in universal use. Recently attention has been called to the elaborate system of drum signals used by the Kamerun negroes, by means of which long messages are sent from village to village. While it was supposed that this remarkable system of communication was confined to a limited region, explorations in the Kongo basin have shown that it prevails throughout Central Africa. The Bakuba use large wooden drums, on which different tones are produced by two drum-sticks. Sometimes the natives "converse" in this way for hours; and from the energy displayed by the drummers, and the rapidity of the successive blows, it seemed that the conversation was very animated. The Galla south of Abyssinia have drums stationed at certain points of the roads leading to neighboring states. Special watchmen are appointed who have to beat the drum on the approach of enemies. Cecchi, who observed this custom, designates it as a "system of telegraphs." The same use of drums is found in New Guinea. From the rhythm and rapidity of the blows, the natives know at once whether an attack, a death, or a festival is announced. The same tribes use columns of smoke or (at night) fires to convey messages to distant friends. The latter are also used in Australia. Columns of smoke of different forms are used for signals by the inhabitants of Cape York and the neighboring island. In Victoria hollow trees are filled with fresh leaves, which are lighted. The signals thus made are understood by their friends. In eastern Australia the movements of a traveller were made known by columns of smoke, and so was the discovery of a whale in Portland Bay. These notes, which might be increased considerably, show the general existence of methods of communication over long distances, — the art of telegraphing in its first stages of development.

NOTES AND NEWS.

RECENTLY much light has been thrown upon the phenomena of glaciation in Greenland. Dr. F. Nansen's daring trip across the inland ice will clear up important questions regarding the meteorological conditions of the interior and the maximum height of land. In the past year Mr. Ch. Rabot has examined the ice phenomena of the west coast, and arrived at the conclusion that the glaciers of Lapland must be considered inland ice in miniature. He is of the opinion that the latter must be considered vestiges of the glacial period in Scandinavia, which have remained to the present day in consequence of particular circumstances. He also observed that the great glacier of Jacobstown has advanced almost two miles since the year 1878.

— Mrs. Amélie Rives-Chanler has offered a prize of \$100 for the best American essay on child-labor. The money has been placed in the hands of Professor Richard T. Ely of Baltimore, secretary of the American Economic Association. The essay must not exceed 55,000 words, and must be in Professor Ely's hands not later than Dec. 2, 1889.

— The Royal Society of Palermo has decorated Professor P. T. Austen of Rutgers College with a gold order, in recognition of his scientific work.

— The following meetings will be held in Paris in August, 1889. viz., Congress of Geography and Ethnology, from Aug. 5 to Aug. 12; Association Française, Aug. 8 to Aug. 15; Congrès d'Anthropologie, Aug. 19 to Aug. 26.

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THE CHARTER of the Maritime Canal Company of Nicaragua has at last been granted by Congress. The plans for this great enterprise have been laid out so carefully, and the difficulties and advantages of the various routes have been considered so conscientiously, that the attempts at obstructing the passage of the bill were in no way justified. The feeling of the House on this subject was well expressed by the applause with which the passage of this important bill was greeted. The resistance offered on the alleged ground that the United States might be obliged to take up the work of the company was the more absurd, as the concession by the State of Nicaragua expressly states that no government except those of Central American States is allowed to hold shares in the company, and that the concession cannot be ceded to the government of any nation. The work will certainly be pushed with as much vigor as the surveys have been carried on, and we do not doubt that the canal will be completed in a very few years. The company has fulfilled the requirements of its concession by the State of Nicaragua, referring to the commencement and completion of the final surveys, and for the organization of an executive company; and the work of construction will also be begun in due time. While the prospects of the construction of the Nicaragua Canal are hopeful in every respect, the formation of the new Panama Canal Company has proved a failure. It will largely depend upon political

events in France, whether the work can be carried on or not; but recent events have proved that the confidence of private capital in M. de Lesseps' enterprise is not sufficient to enable him to carry on the enormous work that has to be accomplished towards the completion of his lock canal. It remains to be seen whether the government of France will be able to withstand the pressure exerted upon it in taking up the work. The long delays and evident difficulty of the route cannot but be of advantage to the Nicaragua Company, which will be able to absorb a large proportion of the working force kept idle at Panama.

THE CAUSE OF PROGRESS AND REFORM in New York City schools received a great impetus last Wednesday, when the Public Education Society submitted, through its committee, a memorial to the Board of Education on the state of the schools. This memorial was received and referred without comment to the committee on reform, to whose own report we have recently made reference in these columns. The memorial opens with the statement that the Public Education Society believes the New York City schools, as at present organized and conducted, to be deficient in respect to accommodations provided, in respect to courses and methods of instruction, and in respect to administration. In support of its belief, the society submits a number of facts. From the perusal of these, we learn that during the past year there were 150,312 pupils registered in all the schools. Of this number, 55,018 were registered in the grammar schools, and 95,294 in the primary schools. For the grammar schools there were provided 1,575 teachers, and for the primary schools 1,741 teachers. From this the society goes on to show, that, although the conditions in the grammar departments are bad enough, those in the primary schools and departments are infinitely worse. The primary schools or departments are invariably placed on the lowest floor of the school-building, where there is the least light, the greatest amount of dampness, and the greatest amount of exposure to foul and unpleasant or unhealthy surroundings. It seems that in the lowest primary grade the classes average in size 87 pupils to every teacher. This fact is in itself astounding, and a sufficient indictment of the entire system. It must be borne in mind that these children are the youngest and most impressionable in the schools, and that many of them are not six years of age. In the next lowest primary grade the classes average 58 pupils to the teacher; and in the grade above that, 56 pupils to the teacher.

It is then shown, that although the regulations of the Board of Education call for very meagre allowances of floor space and cubic air space per pupil, yet the law is violated in hundreds of instances. A list of 185 school-rooms is given in which members of the society, by actual inspection, have found the law to be violated to an alarming extent. For instance: school-rooms meant to hold 52 pupils are found to have 75 in average attendance, and one room which was meant to hold only 44 had 73 little children crowded into it daily. In spite of this overcrowding, 3,873 pupils were denied admission to the schools during the first week in September, 1888. The lack of play-grounds is adverted to, and an admirable suggestion made that the authorities should follow the example of London, and place the play-grounds on the roofs of the school-buildings in cases where the value of real estate does not permit the purchase of ground adjoining the school-houses. In illustrating the deficiency of the courses and methods of instruction, the memorial is very forcible. It shows, that, while the school-children in New York City are hard-worked and the curriculum overcrowded, the progress is not nearly so great as it is in the elementary schools of a number of European countries. It is chargeable, too, against the New York City system, that the course of study is arranged for the sole benefit of those who pursue it throughout, whereas not less than 60,000 children annually leave the public schools before they reach the age of twelve years. These children have had no

thorough or complete training in any one subject, they have merely made a certain amount of progress in a variety of branches; and in a large majority of cases this incomplete and disjointed instruction is all the education that these children will ever receive. The memorial protests against thus subordinating the primary-school course to the grammar-school course and that which succeeds it. The methods of examination and marking are unhesitatingly condemned, and ample evidence is quoted to sustain the charges.

The awkward and incongruous nature of school-administration seems to be very apparent. The Board of Education, the school inspectors, the school trustees, and the assistant superintendents have various and conflicting duties. It seems impossible to reach any sound basis for progress until these methods of administration are simplified and their efficiency increased. Then the improvements necessary in the course of study may naturally follow. The Public Education Society recognizes this fact, and therefore closes the memorial with the suggestion that a special commission, which shall include some members of recognized reputation and authority in matters of education, be appointed to investigate the conditions as they now exist in New York City, and to codify and simplify the school law. We earnestly hope that this proposition of the society will meet the approval of the Board of Education, and that the necessary steps will be taken to carry it into effect. The committee on reform, to which the memorial was referred, is certainly in sympathy with the Public Education Society. It now remains to so press this subject upon the attention of the majority of the Board of Education that the recommendations of the memorial will be adopted.

THE STANLEY EXPEDITION.

THE *Mouvement géographique* prints the various letters which have reached Brussels from Stanley Falls, and it is only now possible to understand somewhat clearly the course of Stanley's expedition. It will be remembered that Stanley sent a letter to Tippo-Tip. About the end of last year Lieut. Alfred Baert, secretary of Tippo-Tip at Stanley Falls Station, was obliged, on account of severe illness, to leave his post. His reports supplement Stanley's letter.

Stanley says that the route from Yambuya on the Aruvimi to Emin's province is excellent, and that provisions can be readily obtained. He does not say how long it took to accomplish the distance from Yambuya to Lake Albert Nyanza, but he states that the way back was accomplished in less than three months.

On the Albert Nyanza he met Emin, who, according to his last letters, was expecting to meet him there. The telegram of Dec. 23 stated that Stanley had left Emin near the Victoria. This fact appeared surprising, as it implied that Emin had left his province. This report appears to be due to a misunderstanding. Stanley saying in his letter that he had left Emin on the Nyanza, referring evidently to the Albert Nyanza, not to the Victoria Nyanza. After having organized a caravan of one hundred and thirty Wangnana, sixty-six men lent by Emin, and three soldiers, Stanley and his four white companions—Nelson, Stairs, Parke, and Monterey Jephson—left Emin on May 27, and returned to Yambuya by the way they had come, in order to look after the rear guard left there in charge of Major Barttelot, who was accompanied by Jamieson, Bonny, Rose Troup, and Ward. On Aug. 17, Stanley, who commanded the vanguard, arrived at Banalya. This place, which has so much puzzled geographers, is situated in Urenia, and is the same place at which Bonny, the commander of the vanguard of Barttelot, encamped on the bank of the Aruvimi. It is situated about fourteen days above Yambuya, and seven or eight days north-east of Stanley Falls. At Banalya, Barttelot was murdered by one of his men about a month before Stanley's arrival. When Stanley arrived, Bonny was still encamped there with part of the men furnished to Barttelot by Tippo-Tip.

On the following day Stanley wrote to the commissioner at Stanley Falls that he intended to stay there for ten days, and asked him to accompany him to Wadelai. Tippo-Tip declined this offer;

and Stanley, after having sent another letter to Stanley Falls, started on his way back to the Albert Nyanza.

Mr. A. J. Wauters, the editor of the *Mouvement géographique*, adds, "It will undoubtedly be found remarkable that Stanley, after an absence of more than a year in the fastnesses of Central Africa, without any news from Europe since May, 1887, did not push on to the Falls Station, where he was sure to meet Europeans and to find news. But he undoubtedly wished to avoid being asked questions regarding his discoveries, and regarding Emin and his projects, and therefore he left Banalya as rapidly as possible."

He re-enforced his caravan by one hundred carriers of Barttelot, his caravan now numbering two hundred and ninety-six men. Mr. Bonny, the only white man of Barttelot's rear guard, still on the Aruvimi, joined the expedition, which started eastward in the beginning of September. If he returned as rapidly as he came from the Albert Nyanza, he must have arrived there about the end of November.

These reports show that Osman Digma's letter, pretending that the Mahdi had captured a European at Lado on Oct. 10, cannot refer to Stanley or to Dr. Parke. They also dispose of the theory that the "white pacha" who was reported from the Bahr-el-Gazal region was Stanley; and Lieut. van Gèle's hypothesis that these rumors referred to his expedition up the Obangi gains some probability.

Stanley's correspondence addressed to Europe reached Stanley Falls on Sept. 14. As Lieut. Baert left the station by canoe, he did not take these important documents along, which were kept back by Lieut. Haneuse. Lieut. Baert arrived at Bangala early in November, where he met the steamer "Stanley," which conveyed a number of men to the Aruvimi, where a station of the Belgian Company was founded at that time. He reached Leopoldville on board this steamer on Nov. 30. Stanley's letters are expected in Europe about a month or two hence.

THE TOPOGRAPHICAL SURVEY OF RHODE ISLAND.

THE endeavors of the Providence Franklin Society to arouse interest in a topographical survey of the State of Rhode Island have found a ready response in the Legislature of that State, and we learn with great satisfaction that the field-work for a map of Rhode Island has been completed. The work has been carried out by the United States Geological Survey on a plan similar to that of Massachusetts, the State and the United States Geological Survey sharing the expense equally. The State of Rhode Island falls upon fifteen different sheets of the great "Atlas of the United States," only five of which are wholly within the State. The total cost of the work to the State of Rhode Island will be five thousand dollars. The commissioners, David W. Hoyt, John W. Ellis, and Winslow Upton, to whose endeavors we owe the taking-up of this important work, conclude their report with some important considerations and suggestions. "The State," so they say, "will obtain a map similar to that which was contemplated in the plan of 1876, on a somewhat smaller scale, at one-quarter the estimated expense to the State. While this topographical survey is complete in itself, for all that it professes to do, it does not undertake to determine the boundary-lines of towns. This has been done in Massachusetts, as supplemental to the topographical survey, under an additional appropriation. Neither does this survey undertake to erect exact and permanent bench-marks from which levels may be reckoned.

"The commissioners desire to call the attention of the General Assembly to the fact that no provision has been made, either by the United States or by this State, for the publication and distribution of this map. To be of service, some arrangement should be made whereby it can be supplied, at a moderate expense, to the citizens of the State, as soon as practicable after all the plates have been received.

"In the atlas published by New Jersey, whose survey has been completed in co-operation with the United States Geological Survey, seventeen sheets are made to cover the entire State. The sheets overlap each other to some extent, and are so arranged as to be of the greatest value for local purposes. Each sheet includes more than three times the surface of a sheet of the United States Ge-

ological Survey, but is constructed on the same scale. These maps are sold at the cost of paper and printing. A somewhat similar plan, requiring five to eight sheets, might perhaps be adopted with advantage in this State. Each city, town, and village should, so far as possible, be found entire upon some one sheet; but to secure this, the original plates must be combined and re-arranged, and adjoining sheets must be made to include the same territory to some extent.

"It is desirable that a wall-map of the whole State should be published, in addition to the atlas form just mentioned. A map about $3\frac{1}{2}$ feet by 5 feet in size would include the whole State, with Block Island in its true position. This could be easily arranged, provided the State authorize some arrangement for such publication."

The three States of Massachusetts, Rhode Island, and New Jersey have thus been the first to secure, by a wise co-operation with the United States Geological Survey, good topographical maps of their whole territories. It is one of the most important objects of this institution to make a good map of the United States, without the aid of which no geological work can be carried on satisfactorily. On account of the wide extent of our country, this enterprise is enormous, and requires a long time for its accomplishment. By the co-operation of States the work which is of the greatest importance can be accelerated, and it is to be hoped that other States will follow the example set by three of their number, the good results of which may be seen from the map of New Jersey, so far the only one published.

THE GREAT STORM OF MARCH, 1888.

IT is only after a long period has elapsed that it is possible to describe accurately the meteorological conditions that prevailed at a certain time over a large area, particularly over extensive parts of the ocean: therefore it has not been possible until recently to write the history of the great blizzard that visited the Atlantic States from March 11 to 14, 1888. Lieut. Everett Hayden, who is in charge of the Division of Marine Meteorology of the Bureau of Navigation, has undertaken this work, and presented the results of his interesting study in the fifth of the "Nautical Monographs." The book, which contains the original observations made by masters of vessels in full, is bound in leather to enable it to stand the rough handling incident to use aboard ship, where books in ordinary cloth bindings are quickly ruined. The list of observations shows how valuable is the aid that voluntary observers aboard ships give to the work of the Hydrographic Office. The history of this memorable storm is based almost exclusively on their reports: therefore the endeavors of the Hydrographic Office to enlist as great a number of masters as possible as voluntary observers, and to increase the general interest in marine meteorology among mariners, deserve the greatest possible success. It is well known how much more readily a man will undertake such observations if he knows that they are actually used, than if he believes that they are buried among a vast amount of material: therefore the plan of publishing a monograph of a remarkable gale, with a complete list of observations appended, will, aside from its scientific value, instigate many a mariner to continue or to take up meteorological observations at sea.

Lieut. Hayden represents the meteorological conditions over the Atlantic coast and the adjoining parts of the ocean in four charts, showing lines of equal pressure and of equal temperature. In order to make the maps clearer, temperatures above freezing are represented in pink; those below freezing, in blue; the depth of shade increasing with the departure from this point. In this way the advance of the cold wave from the interior towards the seacoast is shown with admirable clearness, and the meteorological events are easily understood. In the text, the history of the storm is traced from March 11, 7 A.M., when a long trough of low barometer, extending from the west coast of Florida up past the eastern shore of Lake Huron, and far northward, was advancing eastward, causing strong north-westerly winds on its western side. At 10 P.M. this line had advanced eastward as far as the 74th meridian. The cold north-westerly gale, as it is now sweeping over the great warm ocean-current, carrying air at a temperature below the freezing-point over water above 75°F., is rapidly gaining strength, and be-

comes a fierce hurricane. An area of high barometer, which was at Newfoundland the previous day, is slowing down, blocking the advance of the rapidly increasing storm, and about to hold the centre of the line in check to the westward of Nantucket for days, while a terrific north-west gale plays havoc along the coast from Montauk Point to Hatteras, and until the right flank of the line has swung around to the eastward far enough to cut off the supply of warm, moist air pouring in from the north-east. The special value of Lieut. Hayden's description lies in his clear treatment of the influence of the warm, moist Atlantic air upon the development of the storm. He sums up the observations on this argument as follows: "The storm has called attention anew to the sudden deepening of depressions upon reaching the coast, and the corresponding increase of energy to be expected, — a lesson that should be borne in mind by every navigator leaving port with a falling barometer, and other signs of a storm. It has reminded us of the vitally important influence of the Gulf Stream in causing such increase of energy, and to the necessity of closely watching this great warm ocean-current, and noting any abnormal conditions of volume, velocity, temperature, and position; especially so during the spring and autumn months, — the periods of most rapid change in the conditions of oceanic and atmospheric circulation. The storm has established in most unmistakable terms the importance, not only to our extensive shipping interests, but to the people of all our great seaboard cities, of the establishment of telegraphic signal stations at outlying points off the coast, — at St. Johns and Sable Island, to watch the movement of areas of high barometer, upon which that of the succeeding 'low' so largely depends; and at Bermuda, Nassau, and various points in the West Indies and Windward Islands, that we may be forewarned of the approach and progress of the terrific hurricanes which, summer after summer, bring devastation and destruction along our Gulf and Atlantic coasts." Discussions like the present will contribute largely to arousing and keeping alive an interest in these researches, the practical and scientific value of which cannot be overestimated.

BOOK-REVIEWS.

Allen and Greenough's Latin Grammar. Revised by J. B. GREENOUGH and G. L. KITTREDGE. Boston, Ginn & Co. 12^o. \$1.35.

ADVANTAGE has been taken of the opportunity offered by the necessary recasting of the plates of this book to have such improvements made in it as the advance of grammatical knowledge and the experience of the schoolroom have shown to be advisable. The revisers have simplified the statement of principles, so far as a preservation of strict correctness would admit, but without any approach to a mechanical method of treating the science of language. Many explanations and suggestions, in text and footnotes, have been added to those given in previous editions, for the benefit of teachers and advanced scholars.

In the revision of this work, the needs of the classroom have evidently been kept constantly in view, resulting in great accuracy, combined with clearness and simplicity of statement. Although the matter of the book has been simplified, the size of the book has been increased, for simplification sometimes necessitates expansion. Many things taken for granted or merely suggested in the old edition have been expressly stated in this revision. Much new matter will be found, marking, in many particulars, a substantial advance. Thus, the chapter on word-formation has been entirely rewritten, many new points being presented; the treatment of the temporal particles has been recast; the section on reflexive pronouns has been rewritten; and the chapter on words consists in great part of new matter.

Some other subjects, in the treatment of which the new edition will be found more satisfactory than the old, and to which the especial attention of both student and teacher may be called, are included in that part of the book between Sections 248 and 332. There is also much new philological matter, which is nearly all printed in small-type notes, being intended more for the advanced student than the beginner.

Very numerous cross-references have been furnished in this edition, by means of which the ramifications of a construction,

etc., can readily be traced. In the same way references have been inserted in the grammatical analyses at the head of each chapter.

Typographically the present edition is a great improvement on the old. The pages are much more open and pleasing to the eye; section-headings have been used, and the paradigms have been printed in large full-faced type; important words in the examples are distinguished by the use of black type, and the size of the note type has been reduced, so that there is more difference to the eye than formerly between the text and the notes. The index of words and subjects is enlarged and revised, a separate index of verbs has been added, the glossary of terms has received additions, and the list of authors has been divided into periods. The list of important rules of syntax has been made more complete, and furnished with references to the body of the book, and in its present form will furnish pupils with a convenient and accurate summary. With a few exceptions at the beginning of the book, the section-numbers of the new edition correspond with those of the old, so that references to either are good for the other.

A Text-Book of General Astronomy. By CHARLES A. YOUNG. Boston and London, Ginn & Co. 8°. \$2.40.

THE present work is designed as a text-book of astronomy suited to the general course in our colleges and schools of science, and is meant to supply that amount of information upon the subject which may fairly be expected of every liberally educated person. Therefore it contains no proofs of astronomical theorems, except such deductions as can be explained by the use of elementary algebra, geometry, and trigonometry; its aim being to give a clear, accurate, and justly proportioned presentation of astronomical facts, principles, and methods in such a form that they can be easily apprehended by the average college student.

The author has fully accomplished his object, and his work is excellently adapted to the purposes of teacher and student, the matter being arranged systematically, and presented clearly. A great number of carefully selected illustrations enhance the value of the book and add to its clearness. After a brief introduction, in which the more important definitions are given, the author describes the principal astronomical instruments, the methods of observation, and the corrections of astronomical observations. After the discussion of a few problems of practical astronomy, such as determination of latitude and longitude, the dimensions and shape of the earth and the methods of its determination are described. After explaining the phenomena of the earth's orbital motion, the author proceeds to a description of the movements and physical character of the moon and sun. A special chapter is devoted to eclipses. It is only after the description of these movements that the author takes up the forces causing these motions. He discusses the law of gravitation and the important "Problem of Three Bodies," giving a very clear definition of perturbations. Then the planets are described. Before considering the fixed stars, comets and meteors, and the numerous unexplained phenomena and processes observed in these bodies, are treated in a comprehensive chapter. The book concludes with a discussion of the nebular hypothesis. This brief synopsis shows that the book is thoroughly methodical in its arrangement, and will therefore prove very useful for teachers and students.

The Australian Ballot System. By JOHN H. WIGMORE. Boston, Charles C. Soule. 8°. \$1.

THE object of this work is to describe the method of voting devised by Francis S. Dutton of South Australia, which seems likely to be adopted wherever representative institutions prevail. It has been practised in Australia for thirty years, and was adopted in England in 1872, and soon afterwards in Canada and Belgium. Last year it became the law in Massachusetts; and bills embodying its provisions have been introduced into the legislatures of New York and many other American States. Its essential characteristics are now pretty generally known. The names of all the candidates for a particular office are printed on the same slip of paper, and the voter marks a cross (x) against the name of the person he wishes to vote for. The ballots are printed at public expense, and distributed by public officers. The voter is required to mark his

ballot privately, so that absolute secrecy is secured. The object, and the effect wherever the system has been tried, is to put an end to bribery and intimidation. It being impossible to ascertain how a man votes, you cannot bribe or coerce him to vote as you wish. Mr. Wigmore here gives us a brief history of the system since its origination in Australia, with the arguments in its favor, and then presents in full the statute of Massachusetts, with the essential portions of the South Australian, the English, and several others. He gives also a specimen ballot according to the Massachusetts law, and also a full description, with illustrative cuts, of the mode of voting. Altogether his book contains the most complete and accurate account of the system we have anywhere met with, and may be cordially commended to all interested in political reform.

- (1) *Die Rolle der Suggestion bei gewissen Erscheinungen der Hysterie und des Hypnotismus: Kritisches und experimentelles.* Von Dr. ARMAND HUECKEL. Jena, 1888.
- (2) *Ueber hypnotische Suggestionen, deren Wesen, deren Klinische und Strafrechtliche Bedeutung.* Von JOH. G. SALLIS. Berlin, 1888.
- (3) *Der Hypnotismus und seine Strafrechtliche Bedeutung.* Von Dr. AUGUST FOREL. Berlin and Leipzig, 1888.
- (4) *Eine experimentelle Studie auf dem Gebiete des Hypnotismus.* Von Dr. R. v. KRAFFT-EBBING. Stuttgart, 1888.
- (5) *Ein Beitrag zur Therapeutischen Verwerthung des Hypnotismus.* Von ALBERT, FREIHERRN V. SCHRENCK-NOTZING. Leipzig, 1888.
- (6) *Ueber Hypnotismus.* Von Dr. HERING. Berlin, 1888.
- (7) *Hypnotismus und Willensfreiheit.* Von F. MIESCHER. 1888.
- (8) *Der Hypnotismus in der Paedagogik von einem Schulmanne, und mit einem Vorwort.* Von JOH. G. SALLIS. Berlin, 1888.
- (9) *Hypnotismus und Wunder; ein Vortrag mit Weiterungen.* Von MAX STEIGENBERGER, DOMPREDIGER. Augsburg, 1888.

THE science of modern hypnotism is distinctly of French origin. The greatest of charlatans in this field, who disturbed the peace of so many credulous souls, won his fame and fortune in Paris; and it was in Paris that the successful steps were taken to atone for this injury by bringing these curious and startling phenomena into scientific repute. The movement, once started, grew rapidly, — indeed, with an almost morbid rapidity, — and within the last year or two the phenomena announced as demonstrated among the highly sensitive and very plentiful subjects of Paris seem marvellous, and threaten to overturn or vastly extend the tenets of science. Among much that is strange, much that is new, much that is false, and much that is true, it is difficult to know what to credit, and what to reject.

As has happened often before, the lookers-on are better judges than the players, and the Germans have assumed the attitude of critics. Not as liable as their enthusiastic neighbors to lose self-control in the whirl of interest, they have been calmly sifting the evidence, and assimilating the new to the old, rather than magnifying the novel into the mysterious. For this reason a review of recent German works upon hypnotism — of which those mentioned above form a typical selection, though only a selection in this rapidly increasing literature — may be of service in acquainting an American public with the true aspect of hypnotic research.

Dr. Hückel's pamphlet (1) is doubtless the most important on this list, and deals with the central point of discussion, — the issue between the school of Paris, headed by Charcot, and the school of Nancy, of which Dr. Bernheim may be declared the leader. The former hold that the hypnotic condition is induced by physical causes, such as passes, pressures, etc.; that there are three stages of hypnosis well differentiated, the passage from one to the other being accomplished by physical manipulations (closure or opening of the eyelids, pressure upon the vertex); that the phenomena assume their most typical form, and should be studied in hysterical patients; that the magnet has a distinct physical effect upon sensi-

tive subjects; that such also re-act to the physical effect of drugs when applied at a distance; and that even a certain degree of transfer of mental states is possible in a few subjects.¹ The school of Nancy recognize in all hypnotic states various forms of suggestibility: they regard the phenomena as purely psychical in origin; refuse to admit any supernatural powers or super-physical effects, such as those of the magnet; and explain all such points as due to more or less unconscious suggestion. Dr. Hückel proposes to show that the latter position is capable of accounting for all the observed facts, as well as the flaws in the conclusions and methods of the Paris experimenters. In the first place, all the effects claimed as of physical origin have been obtained by direct suggestion. This shows, at least, that the latter is as powerful an agent as the former. Moreover, the same manipulations have not produced the same results at Paris and elsewhere. Some comprehension by the subject of what is to result seems indispensable. But the important point remains of explaining the Paris results on the suggestion hypothesis. The keynote here is "unconscious suggestion" on the part of the operators, and shrewd anticipation on the part of the subjects. Take the alleged action of metals as an instance. In several cases gold alone brought about the desired effect. The most precious of the metals is, by a very natural analogy, regarded as the most efficacious, and this same preference will be quite general. How little specific influence the gold has, is shown by the fact that gold believed to be copper had no effect, while copper believed to be gold worked quite as well as the genuine metal.

When attention is directed to the patient's arm, it is not surprising that she should expect something to occur with the arm, and, if previously it has been rendered insensitive, it becomes so now. When attention is directed to the other arm, the phenomenon is "transferred." Another very vital influence is contagion. One subject sees the other, or hears of her actions, and exhibits the same results. An *esprit de corps* is thus formed, and this applies especially to the dozen subjects with whom Charcot has done almost all his work. It is almost impossible to realize how stringent the conditions must be to rule out unconscious suggestion. One's expression; tone of voice; manner; choice of words; evidence of interest, of surprise, of satisfaction, — any of these, entirely unconsciously given, may vitiate an entire experiment. A good case is that of a patient seated for three-quarters of an hour in close proximity to a magnet (unknown to herself) without exhibiting any signs of being affected by it, but re-acting promptly when informed of its presence. This must suffice to indicate the line of criticism of this most valuable pamphlet. It gives a surprising glimpse into the subtleness of psychic impressions, and gives an importance to the term "suggestion" not previously realized. One may take as the motto of the Nancy school the saying that another writer prefixes to his work on hypnotism, — "*Possunt quia posse videntur.*"

In a subject that is comparatively new and unusually open to misunderstanding, general expositions and addresses will naturally find a public. To this class belongs the pamphlet by Dr. Sallis (2), with a convenient scheme of classifying the phenomena as motor (those that affect the muscles, such as rigidity, paralyses, contractions, and the like), as sensory (affecting the senses, such as anæsthesia, special and general, suggested blindness, deafness, etc.), and vegetative (affecting organs normally removed from voluntary control, such as the formation of scars and blisters by imaginary burns, the slowing of the heart-beat, the oozing of blood through the skin). In addition to this exposition, the legal and curative effects are well described, and the pamphlet adds another to the many convenient summaries already extant. The point of view is that of the Nancy school throughout.

The essay of Dr. Forel (3), the eminent alienist and naturalist, is more general than its title would suggest. In order to acquaint the legal profession with the aspects of hypnotism of especial import to them, a general exposition is necessary. This is lucidly sketched with many forcible distinctions. Dr. Forel is a staunch adherent of the Nancy school, having derived his experience from Dr. Bernheim himself. He insists upon the close relation between hypnotic and mere normal states. When we ordinarily go to sleep,

we assume an accustomed attitude, in an accustomed place: all this is auto-suggestion. We suggest sleep to ourselves, and, unless distractions refuse to allow us the necessary concentration of mind, we follow the suggestion. Education, too, is largely a matter of suggestion skilfully applied. The educator's tact is the impressiveness of his suggestions. Some persons more readily subject themselves to the direction of others; they are the weak of will, that follow: while others seem Napoleon-like, born to command; their very manner enforces obedience.

The dangers of suggested crime in hypnotic conditions are just so much greater as the suggestions are more readily carried out. This is a serious problem, with which the law courts will soon be found to busy themselves. Especially in post-hypnotic suggestions, when the patient fully believes himself acting from his own motives, and sternly denies any possibility of suggestion, is the danger difficult to meet. The condition seems to demonstrate the truth of Spinoza's dictum, that the illusion of free will is merely the ignorance of the motives of our actions. Dr. Forel partly removes the danger by suggesting that none other but himself can hypnotize the subject; but even this is not a full guaranty. The topic is not yet in a satisfactory condition.

The pamphlet by Dr. Krafft-Ebbing (4) illustrates another mode of studying hypnotism: it is by a close observation of the phenomena in a single case. The patient has a remarkable history of hysteria, and has led an adventurous and irregular life. The right side of her body is insensitive, and she readily falls into the hypnotic condition by suggestion, or even of her own accord. Her control over involuntary functions is especially remarkable. If a characteristic shape, such as a letter of the alphabet, a pair of scissors, a glass cylinder, be held against the skin with the suggestion that it is red-hot, a burn and scar are formed in the shape of the object applied. The healing of this scar can be decidedly hastened by suggestion, and it can even be made to transfer itself to the symmetrically situated spot on the other side of her person. This is, of course, an extreme case. She responds to the action of a magnet (by violent contractions); but as this power is shared by any object in contact with a magnet, and only when the magnet is in the hands of Dr. Krafft-Ebbing, suggestion (perhaps by temperature changes) is the obvious explanation. The action of drugs at a distance failed entirely in her case. She easily accepts fantastic negative hallucinations, — such as that only the head and arms of a spectator are visible, the appearance causing great consternation, — as well as foreign personalities, changing her attitude and even her handwriting to suit the suggested character. Her time-estimates are strikingly exact. She will sleep an exact number of hours suggested, and so on. In brief, we have here a morbidly sensitive subject, and a typical case of the kind of hypnosis liable to accompany pronounced hysterolepilepsy.

The special study of the therapeutic aspects of hypnotism by the Freiherr von Schrenck-Notzing (5) gives one an admirable idea of the extensive activity in these studies. It is mainly devoted to a *résumé* of recent contributions. France and Germany are naturally most extensively noticed; but Belgium, Holland, Austria, Italy, Spain, England and America, Greece, Hungary, Poland, Russia, Norway, Sweden, Denmark, Switzerland, are all represented. There is a special review of hypnotism in France, and one in Spain, and a hospital for the cure of disease by hypnotism has been opened at Amsterdam. Much space is devoted to statistics of cures by hypnotism, the large percentage of successful treatments leaving little doubt of its therapeutic value. Its influence is most marked upon nervous diseases, though by no means restricted to such. The author is careful to caution against a too free use of hypnotism, and insists upon its restriction to professional specialists.

The part that the travelling mesmerist plays in the progress of hypnotism is altogether a dangerous one, and such public exhibitions have been prohibited in the chief countries of Europe. One point in their favor, however, is that they have so often served to arouse interest in the phenomena, and thus promote their scientific consideration. Dr. Hering's lecture (6) is a case in point. Its object is simply to satisfy local curiosity in the matter, — a laudable object, but very imperfectly carried out. His facts lack order, and the uncertain is jumbled together with the well-ascertained. No

¹ These last three points would not be indorsed by *all* the adherents of the Paris school.

particular point of view is represented, the whole treatment being rather amateurist.

Very different in character is the address of Professor Miescher (7). After a clear history of hypnotism, showing its analogies with previous psychic doctrines, and with especial consideration of the work of Dr. Braid and Dr. Liebault, the author describes the chief well-established phenomena from the standpoint of the Nancy school. To this he adds a consideration of the will in hypnotized subjects. We have a state of automatism, in which every impulse must realize itself, but it is an automatism varying in degrees. Not all self-control is lost, any more than in sleep; the loss, too, is quite similar to what occurs in normal conditions. None the less it illustrates how closely a practical freedom of the will is connected with physical conditions, and how readily a state of irresponsibility may be induced.

The anonymous philologist introduced by Dr. Sallis (8) treats a question upon which the French have written much. They have advocated the introduction of hypnotism into the schoolroom to cure wayward children of bad habits. Laziness, pilfering, physical weaknesses, moral foibles, — all have yielded to this all-powerful agent; and an hypnotic moralization seems to be regarded as the automatic educator of the future. It is against this growing opinion that the author writes. He points out the obvious dangers of such a process, hints at cases in which children have learned to hypnotize one another, and urges that its use should be confined to distinctly abnormal children, requiring an abnormal treatment. Education has developed more natural methods of curing such defects, and so peculiar a cure as hypnotism should not be allowed to usurp their place.

As a final illustration of the ramifications of hypnotism, the last pamphlet on our list (9) will do service. The church enters the arena of hypnotism. A passing analogy between the trance states found among hypnotics and the religious ecstasies of saints is sufficient to arouse in Domprediger Steigénberger a fear lest the accredited church miracles will lose their hold upon the people. He thereupon denounces hypnotism as the work of demons, and proceeds to show how different is the basis of the miracles, and ends by claiming, that, inasmuch as hypnotism is avowedly incapable of explaining *all* the wonders of history, it is idle to consider it at all. With such different methods of reasoning, a sympathy between church and science in this topic could hardly be expected; but the shape this mutual misunderstanding takes is interesting.

From this review, however cursory, it is easy to gather some notion of the vastness of the researches still to be elaborated in this field, of the many-sided interests the problems present, and no less of the complicated pitfalls that beset their solution on all sides. Moreover, it may not be too hazardous to claim that one of the great controversies of hypnotism is about settled, — the issue between the Paris and the Nancy schools, the balance of evidence and opinion being decidedly in favor of the "suggestionists."

The English Restoration and Louis XIV. By OSMUND AIRY. (Epochs of Modern History.) New York, Longmans, Green, & Co. 16°.

THIS work labors under a disadvantage, in that its subject is not really an epoch. In English history, indeed, the age of Charles II. may be considered an epoch, though not a very important one; but in the general history of Europe it was rather the close of one epoch and the beginning of another. The earlier chapters of Mr. Airy's book deal with the wars of the Fronde in France, which resulted in the definite establishment of absolutism; while the rest of the work treats of the early years of Louis' reign, but breaks off in the midst of his career. The author, however, has perhaps done as well as could be expected with such a theme, and he shows a clear grasp both of English and of European politics in the period of which he treats. The principal fault of the work is one common to most short histories, — an excessive amount of detail. This is specially conspicuous in the treatment of military affairs and court intrigues, the details of which are of little interest to the reader, though it must be admitted that court intrigues were more important in those days than they are now. Mr. Airy's style is good, and his judgment of men and events marked by good sense and impartiality. His chapters on the Fronde show how different that

movement was from the English revolution, and how inferior in interest; while, on the other hand, he does not fail to point out the ecclesiastical bitterness of the English Parliament after the restoration of the monarchy. In the general politics of Europe the chief interest centres, of course, in the ambitious schemes of Louis XIV., — in his contest with Spain and the Dutch Republic, on the one hand; and his intrigues with the king of England, on the other. The breaking-off of the narrative, however, in the flush of Louis' career, makes it impossible to give a complete picture; and the reader will have to turn to other volumes of the series for the conclusion of the story.

Master Virgil. By J. S. TUNISON. Cincinnati, Robert Clarke & Co. 8°. \$2.

IT is well known that during the middle ages a number of legends connected themselves with the name of Vergil. As a companion of the Devil, as a magician, and as a learned and competent physician, Vergil was presented at various times and by various writers. These legends and their history are curious in themselves, and interesting as indices of certain obscure phases of mediæval thought. Mr. Tunison has, at great labor, collected a vast amount of information on this subject, and now presents it in these interesting essays. The book is too learned to be popular, but it will have a cordial reception from men of letters.

AMONG THE PUBLISHERS.

THE February number (No. 40) of the Riverside Literature Series (published monthly at 15 cents a number by Houghton, Mifflin, & Co., Boston) contains "Tales of the White Hills" and "Sketches by Nathaniel Hawthorne." The "Tales of the White Hills" are "The Great Stone Face," a story about the Profile or Old Man of the Mountain, which is one of the most powerful and famous imaginative writings in all literature; "The Great Carbuncle," founded on a wild and beautiful Indian tradition about the existence of a wonderful gem called by that name; and "The Ambitious Guest," an imaginative story of the memorable mountain-slide in Crawford Notch in 1826, which destroyed the whole Willey family, but left intact their house, from which they had fled in fright. The sketches comprise, "Sketches from Memory," "My Visit to Niagara," "Old Ticonderoga," and "The Sister Years."

— D. Lothrop Company will publish shortly, in their Story of the States Series, "The Story of Vermont," which will be of interest, as there has been no history of the Green Mountain State published for forty years. John L. Heaton, the author, is a well-known Brooklyn newspaper man, and is one of the many editors born and brought up in Vermont.

— Thomas Whittaker announces that the next volume in the Camelot Series will be "Essays of William Hazlitt;" in the Canterbury Poets, "Poems of Dora Greenwell;" and in the Great Writers, "Life of Schiller."

— William R. Jenkins has just published "A Chinese and English Phrase-Book for the Chinese to learn English," which is perhaps the first book with Chinese characters published in America. Its compilers are Dr. T. L. Stedman and K. P. Lee; and, while it is unpretentious in its character, it is excellently adapted to furnish Chinamen with a large vocabulary of colloquial phrases. The first edition of five hundred copies, though only just published, has been taken up so quickly that a second edition is already in the press.

— Alphonse Picard, of 82 Rue Bonaparte, Paris, is publishing an important historical work that will be of value to collectors of Americana. It is entitled "Histoire de la participation de la France à l'établissement des Etats-Unis de l'Amérique." The author is Henri Doniol, director of l'Imprimerie Nationale. Three volumes are now ready, covering the years 1775-79. These explain the efforts of the ministers of Louis XVI. to influence Spain to enter into the alliance against England, which went into effect after the first victories by the Americans over the English, — an alliance which later indirectly was the cause of the famous League of Nantes. The book is published by the French Government in connection with the Universal Exhibition which is to take place in Paris next

summer. It is intended to make the book a specimen of the work of the National Printing-Office.

— "The Last Journal" of the late Lady Brassey will be published here at once by Longmans, Green, & Co. It contains an account of the trip of the "Sunbeam" to India, Borneo, and Australia. The publishers, at Lord Brassey's request, have sought to make this one of the most sumptuous volumes of late years. It is elaborately illustrated from drawings by Mr. R. T. Prichett and from photographs. The woodcuts have been done by the best English engravers; and variety and novelty have been gained by the insertion of some forty monotypes executed in lithography.

— Sir Charles Dilke has been travelling in India, and will present the results of his observations in the March and April numbers of the *Fortnightly Review*. The articles will be of a military character, dealing with the strategical defences of the empire. This review is now issued from New York by the Leonard Scott Publication Company.

— "The Harvard Index for 1888-89" (Vol. XV.) is now ready. This is a complete university directory of officers and students, with complete athletic, base-ball, foot-ball, and boating records, and lists of officers and members of the college societies, the class secretaries, the officers of the Harvard clubs, the holders of academic honors, etc., and is published by the Harvard Index Company, Cambridge, Mass.

— The *Edinburgh Review* for January contains an article on Krakatoa, in which the German and English reports on the great eruption are reviewed.

— We learn from the *Publishers' Weekly* that a meeting of the executive committee of the Jewish Publication Society of America was held on the 21st of January, in the vestry-room of the Temple Emanuel, Fifth Avenue and Forty-fourth Street, New York. The following members were present: the Rev. Drs. Gottheil and Kohut of New York; the Rev. Drs. Jastrow and Krauskopf of Philadelphia; Judge Rosendale of Albany; Jacob H. Schiff, Professor Henry M. Leipziger, Benjamin F. Peixotto, of New York; Professor Charles Gross, Harvard College; Professor Cyrus Adler of Baltimore; Myer Sulzberger, Morris Newburger, S. A. Stern, S. Friedman, Ephraim Lederer, and Miss Mary M. Cohen, of Philadelphia. President Newburger presided, and submitted a roll of nearly one thousand members already subscribed in the States of New York and Pennsylvania. Committees were appointed on membership in the principal cities of the Union. Popular works on Jewish history and literature will soon be published. Membership costs \$3 a year; patrons, \$20; life membership, \$100. Messrs. Schiff of New York, and Guggenheim of Philadelphia, contributed \$5,000 each toward a "Michael Heilprin" fund, the interest only to be used. This fund, started by Jacob H. Schiff, is to be augmented to \$50,000.

— Under the heading "Another Learned Shoemaker," the *Publishers' Weekly* tells of Mr. John Mackintosh, author of "The History of Civilization in Scotland," who will write the volume "Scotland" in the Story of the Nations Series, who is in many respects a remarkable man. He was sent to work on a farm in his native county of Banff at ten years of age, and was subsequently apprenticed to shoemaking, at which trade he worked in various parts of Scotland for fourteen years. In 1869 he opened a small stationary shop in Aberdeen, "and there, on the shop counter," he once wrote, "amid all the noise and bustle of a stirring thoroughfare, the three volumes of my history were written and the proof-sheets corrected and revised, all being done while customers were coming in and out and constantly interrupting me."

— Albert S. Gatschet has published the second volume of his valuable book, "A Migration Legend of the Creek Indians," the first volume of which appeared three years ago in Brinton's Library of Aboriginal American Literature. The present volume is a reprint from the "Transactions of the Academy of St. Louis." It contains the carefully revised text of the speech of Chekilli, chief of the upper and lower Creek, delivered in 1737 at Savannah, before Governor James Oglethorpe, in the presence of several other chiefs. This speech was originally written on buffalo-skin, and sent, together with an

English translation, to England, where it was deposited in the Georgia office at Westminster. All attempts to find the original or the translation have been in vain. Fortunately, however, a German translation of this valuable document is extant. It was made by P. G. F. Von Beck, the commissioner of the Salzburg protestants, who, after having been expelled from their home, had immigrated to America. It has been reprinted in the well-known work of Samuel Urlsperger, "Ausführliche Nachricht von den Salzburgintgen Emigranten, die sich in Amerika niedergelassen haben." Dr. D. G. Brinton translated this speech back into English, and this translation served for the reconstruction of the original speech. Judge G. W. Stidham of Eufaula, Indian Territory, a Hitchiti Indian, undertook this arduous task in both the Creek and Hitchiti dialects. These two translations are contained in the present volume. The texts are followed by a short commentary and a very full dictionary of both dialects. A sketch of the Creek grammar was published in the first volume of this work. While these two chapters make the work indispensable for the linguist, the student of folk-lore will be greatly interested in the discussion of the track of the Kasihta migration. The present volume is accompanied by two valuable ethnological maps showing the location of Indian tribes at the time of the discovery. The work may be obtained from the author, P.O. box 591, Washington, D.C.

— *Shakespeariana* will begin in an early number a teachers' supplement, designed as an exchange among teachers for suggestions, opinions, and experiences in imparting instruction in English literature by means of the works of Shakespeare as a text-book.

— The *Fortnightly Review* for February contains a paper by Mrs. Lynn Linton on "Characteristics of English Women." It is the first of a series which begins historically. Mrs. Linton's papers on "Women in Greece and Rome" were a marked feature of the *Fortnightly* last year.

— *Blackwood's Magazine* for February opens with an article, accompanied with two maps, on "Major Barttelot's Camp on the Aruvimi," which will be found of interest in connection with recent events in Africa. Other notable papers are a review of the life of Titus Oates and the famous "Popish plot," a sketch of Minacoy, a sympathetic notice of Laurence Oliphant by Mrs. Oliphant, and a remarkable story of the Vigilance Committee at San Francisco, entitled "A Philanthropist." Additional chapters of the new novel "Lady Baby" are given, and the miscellaneous articles are of more than usual interest.

— S. A. Moran, principal of the Stenographic Institute, University of Michigan, Ann Arbor, has in preparation a "Type-Writer Dictionary," the object of which is to show the proper spelling and division into syllables of the more commonly misspelled and misdivided words.

— The Moses King Corporation, Boston, has in active preparation "King's Handbook of the United States." It is to contain 520 pages of text, maps, and more than 1,200 small original illustrations. There will be 50 full-page maps, one of each State and Territory, and a double page of the United States, printed in three colors. This book attempts to answer clearly and fully the demands for a general description and a popular history of the United States. The text is being prepared by M. F. Sweetzer, the Boston *litterateur*, and author of many guide-books, etc.

— The "Teachers' Manuals Series," published by E. L. Kellogg & Co. of New York and Chicago, has three new numbers: No. 11, "Argument for Manual Training," by Dr. Nicholas Murray Butler; No. 12, "Temperament in Education," by Dr. Jerome Allen; and No. 13, "School Hygiene," by President G. G. Groff of Bucknell University, Lewisburg, Penn.

— The *School Journal* of New York is publishing a number of valuable monthly four-page supplements, by Hughes, Quick, Allen, Butler, Groff, etc.

— In *The Phrenological Journal and Science of Health* for February, three women are sketched, and portraits of them given: viz., Mary A. Ward, author of "Robert Elsmere;" Margaret Deland, author of "John Ward, Preacher;" and the almost as well known Henrietta H. Skelton, author, and prominent advocate of temper-

ance reform. An analysis of the octogenarians of Massachusetts, and a story of heredity, are full of hints.

— "Sleeplessness in Infancy" is the subject of an article by Dr. M. Allen Starr, professor at the College of Physicians and Surgeons, New York, in the February number of *Babyhood*. "The Causes of Common Colds," by Dr. William H. Flint; "A Mother's Frights," by Mrs. E. W. Babcock; and "A Reformed Primer," by Mr. Louis Heilprin, — are the other leading articles.

— Ticknor & Co.'s February books include a novel by the author of "The Story of Margaret Kent," "A Daughter of Eve;" "Safe Building," by Louis De Coppet Berg, Series I.; and in their paper series, "The Desmond Hundred" (No. 51), by Jane G. Austin (ready Feb. 2), and "A Woman of Honor" (No. 52), by H. C. Bunner (ready Feb. 16).

— *The Contemporary Review* for February (New York, Leonard Scott Publication Company) contains an article entitled "The Bismarck Dynasty," which is unsigned, but is attributed to Sir Morell Mackenzie, and is supposed to have been inspired by the Empress Frederick. It reviews many of the incidents preceding the death of the late emperor, as well as those that followed that event. It is not sparing in its criticism of the present emperor, and calls him an apt pupil of a cynical master, who found no difficulty, moral or sentimental, in treating his mother in a fashion after Count Herbert's own heart, and in treating the Prince of Wales with such discourtesy as to prevent any intercourse between them. The article goes freely into the Geffcken and Morrier affairs.

— The new and forthcoming books of D. Appleton & Co. include "Capital: A Critical Analysis of Capitalist Production," by Karl Marx, translated from the third German edition; "Nature and Man: Essays, Scientific and Philosophical," by the late William Benjamin Carpenter, with an introductory memoir by J. Estlin Carpenter, M.A., and a portrait; "The Florida of To-day: A Guide for Tourists and Settlers," by James Wood Davidson, with railway and county map printed in colors, and illustrations; "Appletons' Cyclopædia of American Biography," edited by James Grant Wilson and John Fiske, Volume VI. (completing the work); "Mental Evolution in Man: The Origin of Human Faculty," by George John Romanes; "The Folk-Lore of Plants," by T. F. Thiselton Dyer; "A Dictionary of Terms in Art," fully illustrated; "The Development of the Intellect," Part II. of "The Mind of the Child," from the German of W. Preyer (International Education Series); and "Co-operative Building and Loan Associations," by Seymour Dexter.

— A recent number of the *Geographisches Jahrbuch* contains a list of the geographical chairs in the universities of different countries. Germany, as before, takes the lead with nineteen chairs. In Austria-Hungary there are fourteen. Denmark has an extraordinary professorship. In France there are nineteen professorships and lectureships connected with the various universities, besides seven lectureships in special institutions. Great Britain figures in the list with two chairs. In Italy there are thirteen professorships; in Holland, one; in Russia, three; and in Switzerland, two.

— The Brooklyn Ethical Association have begun the publication of a series of lectures on the subject of evolution, under the general title of "The Modern Science Essayist;" and the first number of the series, by Daniel Greenleaf Thompson, on "Herbert Spencer," has just been issued by The New Ideal Publishing Company of Boston. It is popular rather than scientific, the object of the lectures being to propagate the evolution doctrine among the masses. Mr. Thompson is evidently a thoroughgoing evolutionist, not only in biology and history, but also in ethics and religion, and he puts Mr. Spencer on the highest pinnacle of fame, declaring him to be "much greater than either" Plato or Aristotle, though he condescendingly admits that these men were "really worthy Greeks, who would be considered good philosophers, as philosophers go in our time." A part of this lecture, or essay, is occupied with biographical and personal anecdotes of Mr. Spencer, which every reader will find interesting; and the rest gives a brief summary of his leading doctrines, with special stress on their religious and ethical bearings. The second paper of the series will relate to Darwin, while the

succeeding ones will deal with various aspects of the evolution philosophy.

— Professor Nicholas Murray Butler has given to the public his "Argument for Manual Training," originally read before the American Institute of Instruction, and the pamphlet is published by E. L. Kellogg & Co. of New York. Professor Butler is an enthusiast on the subject of which he treats, and declares that "a movement at once so philosophic and so far-reaching as that in favor of manual training has not come into educational thought since Comenius burst the bonds of mediævalism two and a half centuries ago." He holds that under our present system of education there is no adequate training of the executive and constructive faculties, and that the defect can only be supplied by regular manual exercises in the common schools. His arguments in favor of the system are not specially new, but they are clearly and forcibly presented, and will be interesting to educators everywhere. An appendix to the pamphlet gives a brief summary of the course of manual training that has been followed for some time in the schools of Jamestown, N.Y., so that those not already familiar with the system can see what it is.

— Mrs. Oscar Wilde appears as a contributor to the *Woman's World* for March (Cassell & Company), as does the famous novelist "Ouida" and the equally famous author of "How to be Happy though Married."

— In *The Truth Seeker* of Feb. 16 will be published "The Limitations of Toleration," a discussion between Col. Robert G. Ingersoll, Hon. Frederick R. Coudert, and Gov. Stewart L. Woodford, before the Nineteenth Century Club of New York, stenographically reported for *The Truth Seeker* by I. N. Baker. The publication of this discussion has been delayed from various causes. F. R. Coudert is a Roman Catholic, and one of the best orators of New York. Gov. Stewart L. Woodford is a Protestant, and a splendid speaker. The discussion is the only oral public debate ever engaged in by Col. Ingersoll. He had the opening and the closing of the argument, and made two of his most forcible and eloquent speeches. President Palmer's introductions of the orators will also be given.

— The three methods employed for making window-glass will be described and pictured in *The Popular Science Monthly* for March by Professor C. Hanford Henderson of Philadelphia. Dr. Andrew D. White will conclude the subject of "Demonic Possession and Insanity," which forms one of his "New Chapters in the Warfare of Science," now publishing in that magazine. The forthcoming article will tell how the Roman Catholic, Lutheran, and Calvinistic clergy vied with each other, in exorcising and persecuting the unhappy victims of insanity, and how medical science slowly introduced more humane treatment, and finally drove back superstition from this part of the great battle-field. The relations of "Competition and the Trusts" will be discussed by Mr. George Iles, who first points out the great waste of effort and other losses, due to competition, and takes the ground that the trusts have, on the contrary, reduced the costs of business, and hence, if duly regulated, can serve the public better than competition. Many educators, who would be glad to use science in the training of young pupils if they knew just how to go about it, will be interested in the practical directions given in an article on "Natural Science in Elementary Schools," by J. M. Arms. Mr. Arms writes with a full appreciation of the true aims of science-teaching, and from an experience of ten years in the work.

— The *Nineteenth Century* for February (New York, Leonard Scott Publication Company) contains Professor Huxley's famous article on agnosticism. An interesting symposium is given on noticeable books, with contributions by Mr. Gladstone, Frederic Harrison, Rowland E. Prothero, W. S. Lilly, Augustine Birrell, Hamilton Aidé, the Rev. Dr. Jessopp, and Mr. Morley. Further comments are given on the relation of examination to education, by W. Baptiste Scoones, Hon. Auberon Herbert, Sir Frederick Pollock, Sir Joseph Fayrer, Francis Galton, Dr. Priestley, and the Bishop of Carlisle. Among other contributions is one from his Majesty the King of Sweden and Norway.

LETTERS TO THE EDITOR.

*.*Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.

Twenty copies of the number containing his communication will be furnished free to any correspondent on request.

The editor will be glad to publish any queries consonant with the character of the journal.

Tornadoes: Fact vs. Fiction.

THERE is no subject in meteorology of more absorbing interest than this. As our knowledge of the environment of tornadoes increases, there must necessarily be modifications in our views of their origin. One of the more recent and most significant of these changes has been the transference of the cool northerly wind, meeting the warm south wind, from the earth's surface to the upper regions, where it is said to overflow the lower current, and produce an unstable equilibrium in the atmosphere. It would seem as though no subject can demand, more strongly than this, a solid substratum of fact; and yet, strange to say, the theories and speculations about these terrible visitors have been far more extensive than the facts. This seems a favorable time to state a few of the more prominent facts and seeming fictions. The facts are these:—

1. It has been well said that the most important recent development has been the fact that tornadoes occur, not at the centre of a general storm, but about four hundred miles to the south-east. This fact was known fifteen years ago, but was first strongly emphasized in March, 1884.

2. All currents in this region, even up to a great height, are from the south before the tornado, as is well known from observations of the upper clouds.

3. The tornado invariably moves to the north-east; and if, as some believe, it takes its motion in the upper current, that must be from the south-west, and cannot be from the north even after the tornado.

4. The pressure rises in a tornado, as has been observed a few times in it, and it invariably rises at the centre of a thunder-storm, which frequently develops into a tornado.

5. That some other force than a violent gale blowing into a partial vacuum is concerned in the destruction, is well shown by the fact, that of two free barrels side by side, one of which was empty and the other full, the former was left undisturbed, while the other was completely obliterated. Fowls have been stripped of their feathers, and people deprived of their clothing, which could not be brought to pass by the most violent gale.

6. The tornado is extremely sudden, and, advancing without any warning, it interjects itself into a region of gentle southerly winds. After it has passed, the southerly wind almost at once again predominates. The whole appearance is as though a disturbance, largely having its own source of energy, had suddenly projected itself into a quiet air, and passed on without bringing about any but a momentary change.

7. Its velocity is nearly double that of the accompanying general storm.

8. Numerous thunder and hail storms are an invariable accompaniment.

A few fictions are the following:—

1. Professor Ferrel states on p. 327, "Recent Advances in Meteorology," that in the tornado there is an unstable equilibrium due to "the large vertical gradient of temperature decreasing with increase of altitude."

2. Mr. Finley, in *Science* of Feb. 1, thinks that this same condition must be found, not in the tornado, but in the region just around it.

3. This abnormal decrease of temperature is due to cold air overrunning warm. This is really an impossible condition, since the denser cool air must always under-run that which is lighter and warmer. That a most extraordinary decrease of temperature and most extreme unstable equilibrium, possibly five hundred times as great as can ever occur under natural conditions, does not produce a destructive whirl, advancing scores of miles from its origin, is well shown by the seas of fire extending many square miles in forest clearings. Here there is a temperature at least 1000° higher than that of the air two or three hundred feet above it. There are

occasional whirls set up over such a fire, but they are short-lived, and extend only to its edge.

4. There is a violent uprush of air at the tornado centre. As we have just seen, the tornado is not at the storm-centre, but four hundred miles to the south-east, where there is no rising tendency in the air.

5. There is a uniform flow of northerly upper currents over an extended region, and tornadoes are produced at spots one hundred miles apart by the breaking-through of the warm lower air.

6. The tornado, in its onward motion dipping here and there for one hundred miles and more, has its energy kept up by a continual upsetting of the equilibrium, conveniently occurring just in front of it exactly at the moment of its advance, and nowhere else. These latter certainly have no facts to sustain them, and must be regarded as impossible or highly visionary till observations in the cloud region give still further facts. Until these facts are had, it is unsafe to theorize.

H. A. HAZEN.

Washington, Feb. 4.

A Deadly Gas-Spring in the Yellowstone Park.

THE familiar fable of the upas-tree, living in a valley of death wherein all life was killed by its deadly exhalations and the ground was strewn with the bones of its victims, has been proven, like many a traveller's tale, to be a highly colored and exaggerated account of a natural phenomenon. The upas-tree is now well known to have poisonous sap, but not poisonous vapors. But the story survives in the accounts given of the Death Valley of Java, which it was long believed no traveller could cross, "wherein every living being which penetrated the valley falls down dead, and the soil is covered with the carcasses of tigers, deer, birds, and even the bones of men, all killed by the abundant exhalations of carbonic-acid gas, with which the bottom of the valley is filled." Such is the description given by Lyell¹ of this famous valley; while another locality is described as a place where "the sulphurous exhalations have killed tigers, birds, and innumerable insects, and the soft parts of these animals are perfectly preserved, while the bones are eroded and entirely destroyed. The researches of Junghuhn² have shown that these accounts are much exaggerated, the "valley of death" being a funnel-shaped depression but one hundred feet in diameter, instead of a valley half a mile across. In the bottom of this depression there is a hole about fifteen feet in diameter, from which gaseous emanations are given out, which at times accumulate to a depth sufficient to envelop and suffocate animals on the bottom of the hollow. Repeated visits by Junghuhn, extending over a period of twelve years, showed that the amount of gas varied greatly from time to time, but rarely ever rose over two feet and a half above the bottom. At the time of his earlier visit, he found the body of a Javanese native in the depression, but experienced no difficulty or oppression while there himself. This same body was still undecomposed, owing to the preservative effect of the layer of gas, when he repeated his visit eighteen months later. The only other remains seen during his subsequent visits were the carcasses of six swine which were decomposed and putrid. At this time the absence of the gas was shown by the presence of a crow feeding upon the dead bodies.

Though thus shorn of much of its former glory, this Pakaraman, or poison-hole, is the largest and most dangerous of the gas-springs or mofettes of Java, and indeed of the world, and really deserves the title of a natural death-trap. Though such emanations are common in all volcanic regions, this has been the only place known where the gases have accumulated, and caused the death of the larger animals.

In the Yellowstone National Park, now so well known as the wonderland of America, there is a place equalling this famous death valley, and where the gaseous exhalations have proved fatal to numerous bear, elk, and many smaller animals.

This place, to which the appropriate name of "Death Gulch" is given, was discovered by the writer during the past summer (1888), while making a geological examination of the region for Mr. Arnold Hague, the geologist in charge of the survey of the park. It is situated in the extreme north-eastern portion of this reservation, a

¹ Principles of Geology, 1878, i. p. 590.

² Java Seine Gestalt, etc., German translation by Hass Karl, ii. p. 202.

short distance south of the mail-route, which, leaving Lamar River, follows up Soda Butte Creek to the mining-camp of Cooke City. In this region the lavas which fill the ancient basin of the park rest upon the flanks of mountains formed of fragmentary volcanic ejecta, the tertiary andesitic breccias, which rest in turn upon nearly horizontal paleozoic strata; while the hydrothermal forces, which are represented by the geysers and hot springs of the central portion of the park, where the lava-sheet is thicker, show but feeble manifestations of their energy in the almost extinct hot-spring areas of Soda Butte, Lamar River, Cache Creek, and Miller Creek. Although hot water no longer flows from the vents of these areas, the deposits of travertine, sinter, and decomposed rock, attest the former presence of thermal springs. Gaseous emanations are now given off, however, in considerable volume, producing extensive alteration in the adjacent rocks, and giving rise to sulphurous deposits.

It is at one of these places that the fatal ravine is found. Situated on Cache Creek, but two miles above its confluence with Lamar River, it is easily reached by a horseback ride of some five miles from the mail station of Soda Butte. The region is, however, rarely visited; for hunting is forbidden in the park, while the place has not been known to present any attraction for the few visitors who pass near it on their way to the well-known Fossil Forests and the weird scenery of the Hoodoo basin.

An old elk-trail, which runs along the north bank of Cache Creek, affords easy travelling, and leads to a little opening in the pine-forest bordering on the stream. In the centre of the meadow is a shallow depression, once the bed of a hot-spring pool, now dry, and covered with an efflorescence of salt, making it attractive to the elk and other game of the region as a "lick." The banks of the creek opposite this meadow and below it are covered with the ancient hot-spring deposits, which are very dense and hard, and at the borders of the stream have been polished by the action of the water until the surface shines like glass. A hot-spring cone half washed away by the creek, and a mound of altered travertine on the opposite bank, show the character of the ancient hot-spring water, the rippled surface of the deposit being exactly like that of the beautiful terraces and slopes of the Mammoth Hot Springs. At present, however, the only thermal action is the emission of a little tepid sulphurous water at the edge of the stream. On the other hand, the gaseous emanations are very striking and abundant.

In the middle of the creek, which here forms a deep pool about thirty feet across, bordered by the polished calcite already mentioned, the water boils up furiously at several places. This water is, however, quite cold; and the "boiling" is caused by the very copious emission of gas, mainly, no doubt, carbonic acid, though containing some sulphuretted hydrogen, since its smell is quite noticeable, and the water is slightly turbid with particles of sulphur, which also coat the sides and bottom of the pool. Rising through the water of the creek, the great amount of gas given off at this place is easily appreciated, but equally copious emanations may occur from the deposits and old vents near by, which, being invisible, remain unnoticed.

Above these deposits of altered and crystalline travertine, the creek cuts into a bank of sulphur and gravel cemented by this material, and a few yards beyond is the debouchure of a small lateral gulley coming down from the mountain-side. In its bottom is a small stream of clear and cold water, sour with sulphuric acid, and flowing down a narrow and steep channel cut in beds of dark gray volcanic tuff. Ascending this gulch, the sides, closing together, become very steep slopes of white decomposed rock, the silicious residue formed by the decomposition of the rocks by acid vapors or waters. The only springs now flowing are small oozes of water issuing from the base of these slopes, or from the channel-bed, and forming a thick, creamy, white deposit about the vents, and covering the stream-bed. This deposit consists largely of sulphate of alumina. The slopes show local areas where sulphur has been deposited by the oxidation of sulphurous vapors, but no extinct hot-spring vents were found. About one hundred and fifty feet above the main stream, these oozing springs of acid water cease; but the character of the gulch remains the same. The odor of sulphur now becomes stronger, though producing no other effect than a

slight irritation of the lungs. The gulch ends, or rather begins, in a "scoop" or basin about two hundred and fifty feet above Cache Creek; and just below this we found the fresh body of a large bear, a silver-tip grisly, with the remains of a companion in an advanced state of decomposition above him. Near by were the skeletons of four more bears, with the bones of an elk a yard or two above; while in the bottom of the pocket were the fresh remains of several squirrels, rock-hares, and other small animals, besides numerous dead butterflies and insects. The body of the grisly was carefully examined for bullet-holes or other marks of injury, but showed no traces of violence, the only indication being a few drops of blood under the nose. It was evident that he had met his death but a short time before, as the carcass was still perfectly fresh, though offensive enough at the time of a later visit. The remains of a cinnamon bear just above and alongside of this were in an advanced state of decomposition, while the other skeletons were almost denuded of flesh, though the claws and much of the hair remained. It was apparent that these animals, as well as the squirrels and insects, had not met their death by violence, but had been asphyxiated by the irrespirable gas given off in the gulch. The hollows were tested for carbonic-acid gas with lighted tapers without proving its presence; but the strong smell of sulphur, and a choking sensation of the lungs, indicated the presence of noxious gases, while the strong wind prevailing at the time, together with the open nature of the ravine, must have caused a rapid diffusion of the vapors.

This place differs, therefore, very materially from the famous Death Valley of Java and similar places in being simply a V-shaped trench, not over seventy-five feet deep, cut in the mountain-slope, and not a hollow or cave. That the gas at times accumulates in the pocket at the head of the gulch, is, however, proven by the dead squirrels, etc., found on its bottom. It is not probable, however, that the gas ever accumulates here to a considerable depth, owing to the open nature of the place and the fact that the gulch draining it would carry off the gas, which would, from its density, tend to flow down the ravine. This offers an explanation of the death of the bears whose remains occur, not in this basin, but where it narrows to form the ravine; for it is here that the layer of gas would be deepest, and has proven sufficient to suffocate the first bear, who was probably attracted by the remains of the elk, or perhaps of the smaller victims of the invisible gas; and he, in turn, has doubtless served as bait for others who have in turn succumbed. Though the gulch has doubtless served as a death-trap for a very long period of time, these skeletons and bodies must be the remains of only the most recent victims; for the ravine is so narrow and the fall so great, that the channel must be cleared out every few years, if not annually. The change wrought by the water during a single rain-storm, which occurred in the interval between my first and second visits, was so considerable that it seems probable that the floods of early spring, when the snows are melting under the hot sun of this region, must be powerful enough to wash every thing down to the cone of *débris* at the mouth of the gulch.

Gaseous emanations are very frequent in volcanic countries, and may be either temporary or permanent. The former are, as is well known, particularly abundant after volcanic eruptions. The gases emitted from fissures in the flanks of Vesuvius are said to have killed thousands of hares and pheasants, and whole herds of cattle have been suffocated by volcanic gas given off near Quito. The permanent emissions of gas, such as the mofettes of Italy, the Laacher See, and the Auvergne, remain unchanged, however, for centuries. Where carbonic-acid gas is evolved from a fairly uniform surface, it is quickly diffused into the atmosphere upon the slightest movement of the air; but the case is quite different when the gas is emitted in caves or hollows in the ground. In such places it accumulates, because of its density and slow diffusion, until the hollows are filled to the brim, any excess being quickly diffused as from a level surface. Small hollows of this kind occur in the travertine deposits of the Mammoth Hot Springs of the park, and near the Hot Lakes of the Lower Geyser basin. In these places, small birds, mice, etc., attracted by the warmth of the vapors, or the dead insects, are often suffocated by the gases. Such hollows resemble the mofettes of the Laacher See in Germany, where

dead mice and birds are always found, and are common in other regions as well. The well-known Grotto del Cano, near Naples, is the most familiar example of such accumulations of carbonic-acid gas; and visitors are frequently entertained by the asphyxiation of a poor dog, while the guide, whose head rises above the gas, is not affected by it. Death Gulch is, however, without a peer as a natural bear-trap, and may well be added to the list of the wonders of the Yellowstone Park.

WALTER H. WEED.

U. S. Geol. Surv., Washington, Jan. 30.

A New Method for the Microscopical Examination of Water.

IN making microscopical¹ examinations of potable waters, it is entirely impracticable, on account of their relative purity, to proceed directly. Repeated examinations of random samples might yield absolutely nothing, although filtration of a few cubic centimetres through a fine cloth might show that in the same water there were abundant microscopic forms.

The importance of being able to ascertain the presence of these microscopic organisms, and to determine their number and species in any given sample of water, is self-evident. It is important, not only from a purely scientific, but also from a sanitary, point of view, to know precisely what is contained in drinking-water. Again: large manufacturing interests are dependent upon the purity of the water supplied to them through filters or otherwise, while many large towns depend upon the efficiency of filters for the purity of their water-supply. A microscopical examination of the water before and after filtration shows very clearly the actual work which the filter accomplishes, in a way that it is impossible for chemical analyses to do. From a scientific and sanitary point of view, microscopical examinations are accordingly of great value both as a means for the study of the organisms themselves, and of the influences of changes in the water upon their growth, life, and death, as well as the counter effects produced upon the water by them. For making such examinations there have been hitherto, so far as I know, but two methods employed. One of these is that proposed by Dr. J. D. McDonald in his "Guide to Microscopical Examination of Water" (J. & A. Churchill, London, 1883). In this method the sample to be examined is put into a tall glass cylinder, at the bottom of which is a watch-glass suspended by a platinum wire. This is allowed to stand for forty-eight hours, in order that the matters held in suspension may settle into the watch-glass at the bottom. The upper water is then siphoned off, and the contents of the watch-glass examined under the microscope.

The other method, the origin of which I do not know, is used at present by the Massachusetts State Board of Health. In this method a given quantity of water is passed through a fine linen or cotton cloth tied to the lower end of a funnel. After the water has passed through it, the cloth is removed, and cautiously reversed over the end of a glass tube, the numerous objects which have been caught upon the cloth being now upon the outside. A slide is then placed under the cloth, and a puff of air blown through the tube. The moisture contained in the cloth collects in a drop, which falls upon the slide, carrying with it theoretically the materials filtered out of the water. The slide is then examined under the microscope, and the organisms obtained counted. Both these methods are open to very serious objections, and are so crude that no fair estimates of the number of organisms contained in a given sample of water can be formed. In the case of the first method, I have found that by no means all of the microscopic organisms settle to the bottom, even when the water is left standing a much longer time than forty-eight hours, as there are many which have about the same specific gravity as water, and consequently do not settle. This source of error becomes greater in proportion as the water to be examined becomes purer. In the case of ordinary drinking-water, the sediment is very inconsiderable, although there are large numbers of organisms held in suspension. Under ordinary circumstances, water left standing in this way gives an excellent opportunity for the organisms present to increase. Especially is this the case with filtered water, where the increase is surprisingly rapid. From this it is plain that the sediment in the watch-glass does not represent what was originally in the water, but only

a small part of that amount plus a part of the increase which has since taken place. In the second method, if the cloth be examined microscopically after presumably all the microscopic organisms have been removed, it will often be found that a very large number are stuck in the meshes of the cloth.

For these two methods I have substituted one which, although far from perfect, gives much better results. I have now been using it for four months in making microscopical examinations of water for the city of Boston.

The new method is as follows. A known quantity of water (I have found 100 cubic centimetres a convenient unit) is put into a funnel in the tube of which is half an inch in depth of sand (24 to 30 grains to the inch). The sand is held in place by a stop made of a roll of brass wire gauze, which gives free passage to the water, while it holds the sand in place. Through this the water is filtered, the sand holding back the microscopic forms. The experiments which I have tried, to test whether all the organisms are removed or not, have proven conclusively the efficiency of the sand in holding back all the microscopic organisms in the water. After all the water has passed through, the stop is removed, and one cubic centimetre of distilled water (the water which has just been filtered will answer as well) is thrown into the funnel by means of a pipette. This washes the sides of the funnel, and carries the sand with it down into a watch-glass which is held underneath to receive it. On falling into the watch-glass, the grains of sand separate and sink to the bottom, leaving the lighter organisms which have been caught between them mostly suspended in the water. By stirring this wash-water a more even distribution of the organisms is obtained, and, if any have been carried to the bottom by the falling sand, they are liberated; so that if the wash-water be poured off, and the sand examined under the microscope, it will be found that there are no more organisms among it than might be expected. Some of the water standing above the sand is immediately transferred to a slide containing a chamber the capacity of which is one cubic millimetre. All the microscopic organisms contained in this chamber are then counted under the microscope, and from the result the total number of organisms in the original sample is computed. I have found this cubic millimetre surprisingly representative of the whole mass of the wash-water, as far as the numbers go, although, as would naturally be expected, the species vary largely in different samples.

This method, as the first which can fairly be called quantitative, opens up a new field, having wide and practical applications. It is to be hoped that microscopical examinations may hereafter take their proper place alongside of bacteriological and chemical analyses, to which they must form important adjuncts.

A. L. KEAN.

Mass. Inst. Technol., Boston, Feb. 1.

Triple Births in the Human Race.

I WAS much interested in the note published in *Science* of Feb. 8, upon triple births in the human race, and I beg to direct your attention to a curious case to be found among the records of Middleboro [Mass.], in which triple births occurred in two successive generations of the same family.

Elisha Vaughan married Joanna Morton, daughter of John Morton of Middleboro.

Children of Elisha and Joanna Vaughan.

Hinksman		b. 1708, Jan. 11.
Mercy	}	b. 1711, July 12.
Sarah		
Thankful		
Thomas		b. 1714, Dec. 1.
Hannah		b. 1717, Oct. 25.

Children of Hinksman and Desire Vaughan.

Hannah		b. 1733, April 29.
Elisha	}	b. 1735, June 1.
Abraham		
Ebenezer		
Abigail		b. 1737, March 21.

The town and church records in Middleboro comment upon the curious reversal of the sexes in the two generations.

ALEXANDER GRAHAM BELL.

Washington, Feb. 11.

¹ It is convenient to designate by "microscopic" all forms of life visible only by means of the microscope, exclusive of the bacteria.